AFIT/GCM/LAS/99S-1

THE IMPACT OF ACQUISITION REFORM
AND POLITICAL-FISCAL VARIABLES ON
AIR FORCE GAO-PROTESTS PROCESSED

THESIS

Raymond M. Barben
Captain, USAF

AFIT/GCM/LAS/99S-1

Approved for public release; distribution unlimited

19991026 037

The views expressed in this thesis are those of the author
and do not reflect the official policy or position of the
Department of Defense or the U.S. Government.

THE IMPACT OF ACQUISITION REFORM

AND POLITICAL-FISCAL VARIABLES ON

AIR FORCE GAO-PROTESTS PROCESSED

THESIS

Presented to the Faculty of the Graduate School of Logistics

and Acquisition Management of the Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Contracting Management

Raymond M. Barben, B.A.

Captain, USAF

September 1999

Acknowledgments

I would like to express my appreciation to Colonel Barry Wilson and Mr Jerry Aldridge at SAF/AQCX for taking time out of their busy schedule to accommodate my visit to gather the protest data and advice on the study. I would be remiss not to thank Colonel Bobby Moore for his influence on my contracting career and decision to attend the AFIT Contract Management Program. Next, I extend my thanks to Lt Col Richard L'Heureux and Maj Dave Petrillo for giving me the appropriate combination of guidance and independence to complete this thesis. Finally, words cannot express my gratitude for the support and understanding of my wife, Nicole, throughout this entire program. Without her inspiration and support over the last 15 months, I would not have completed this thesis.

Raymond M. Barben

Table of Contents

List of Figures

List of Tables

AFIT/GCM/LAS/99S-1

Abstract

The problem in this study is to determine whether Air Force contract protest frequency rises or falls with reforms in the acquisition process, number of AF Contract Actions and Dollars, AF GAO Sustain Rate and/or General Economic Conditions. The study outlines the possible relationships between the independent variables (previously listed) and the dependent variable (protests). The number of AF GAO-Protests Processed was used to represent the number of protests; therefore, care must to taken in generalizing results to other protest forums or services. Multiple regression techniques were employed to test the statistical significance of the models' response and predictor variable(s). The results indicated that AF Contract Actions, Dollars, and General Economic Conditions were statistically significant as a predictor of AF GAO-Protests Processed; however, the GAO Sustain rate was not useful. Incorporating the qualitative variable, the researcher determined that the FASA/FAR 15 (efficiency reform years) were not statistically significant to the model. In conclusion, the study points to the complex dynamics associated with measuring trends with the number of protests associated with a particular variable. Secondly, the acquisition reforms of the 1990s have not been in existence long enough to be tested with a high degree of reliability. Implications for the AF decision-maker and professional are discussed and recommendations for future study are presented. Air Force decision-makers will be able to use the results of this study as part of an overall assessment of acquisition reform and the bid protest process.

THE IMPACT OF ACQUISITION REFORM AND POLITICAL-FISCAL VARIABLES ON AIR FORCE GAO-PROTESTS PROCESSED

I. Introduction

Problem

Federal contractors expend a great deal of resources in the preparation of bids/offers in response to an Air Force solicitation. In this competitive and highly volatile environment, AF agencies strive to maintain the integrity of the acquisition process through a fair evaluation of all responsive bids/offers. If a perspective offeror/bidder perceives the slightest inequity in the process, they may exercise the right to legally challenge the award of an Air Force contract. The likelihood of a protest may be influenced by acquisition reform initiatives, size of the AF procurement budget, number of contract actions and/or general economic health. While these external factors may be out of the acquisition professional's control, an understanding of complex and dynamic relationships will provide AF decision-makers a tool to identify trends in contract protest frequency.

Importance of Research. As the number of protests received by GAO exceeds 2,500 annually (Metzger and Golden, 1997: viii), acquisition professionals should be concerned about the bid protest's significance. Such actions involve attorney fees, administrative costs, witness fees, and filing fees incurred by the Government and

1

contractor (Duncan, 1997: 9). In addition, contract performance may be suspended during protests, preventing timely delivery and satisfaction of Government requirements (Duncan, 1997: 9). When these delays involve major programs, the resultant costs could conceivably amount to millions of dollars (Duncan, 1997: 9).

Recent DOD examples highlight the explicit and implicit costs associated with a protest. A $673M Navy TAC-4 Computer Work Station contract award was held up by a single disappointed bidder (Electronic News, 1996: 2). A contractor's protest of a $23.5M satellite component contract forced the Air Force to halt phase II of an acquisition program (Electronic News, 1995: 1). The delays and costs represent a great burden on the public and private sector. In an effort to improve Government-contractor business relations, acquisition reforms have targeted the bid protest mechanism, post-award debriefing and source selection procedures. Various reforms between 1984-1996 have emphasized improved communication, increased competition, and contracting officer autonomy.

Background. When Congress made the General Accounting Office (GAO) procurement protest system part of the Competition in Contracting Act (CICA) of 1984, they believed that "a strong enforcement mechanism is necessary to insure that the mandate for competition is enforced and that vendors wrongfully excluded from competing for Government contracts receive equitable relief" (Coburn, 1985: 47). The Federal Acquisition Streamlining Act of 1994 (FASA) instituted various reforms to make the federal procurement system more efficient, more accessible, and more competitive (Gamboa and others, 1997: 3). By addressing the fair competition issue, the law should have decreased the number of protests.

The number of new protests fell by 18% in the first half of FY 1998; however, the GAO's sustain rate rose from 12% to 18% (Gordon, 1998: 5). In FY 97, the top reasons for protests in the Air Force were improper evaluation, challenge of awards, defective/restrictive specifications, and exclusion from the competitive range (SAF/AQC, 1998:1). Protests may be declining because source selection officials are doing a better job with their procurements; however, the trends could be related to other external and internal factors (Gamboa, 1998: 4). There are many external factors that play a role in a contractor's decision to protest, such as financial health of the firm, size of the Department of Defense budget, and overall economic conditions (Thomas, 1997: 17-18).

In order to make an accurate assessment of acquisition reform's effect on bid protests, the Air Force needs to take an objective look at protest trends and associated conditions. A historical analysis that culminates with statistical results may shed light on the utility of continued reforms in the bid protest arena. While the results of the research will not establish causal relationships, the statistical correlation will provide Air Force decision-makers a tool to identify trends in contract protest frequency.

Management Questions

Management questions surface regarding acquisition reform and external factors related to the number of protests in the AF. Have acquisition reform initiatives affected the number of protests filed? Do other external factors influence the amount of protests filed? How much have acquisition reform initiatives affected the number of protests filed relative to external factors?

<u>Research Objectives</u>

The primary objective of this research is to determine whether acquisition reform measures have made an impact on the number of protests filed. Since a number of professionals point to other external conditions that influence the protest decision, other external factors will be introduced as variables. Consequently, another research objective will be to determine if the number of contract actions, amount of contract dollars awarded, and GAO sustain rate affected the number of protests. Finally, the research will analyze contractor protests with relation to general economic health (represented by the unemployment rate).

The objectives are listed below:

- Identify trends in the number of protests filed from 1984 – 1998.

- Identify the protest trends associated with CICA, FASA and FAR 15 rewrite.

- Identify the protest trends associated with the AF Contract actions and Dollars awarded.

- Identify the protest trends associated with general economic conditions (unemployment rate).

- Determine if a significant statistical relationship exists between acquisition reform and the number of protests filed in the AF.

- Determine if a significant statistical relationship exists between the contract actions, dollars awarded and general economic conditions with the number AF GAO-Protests Processed.

- Test and evaluate the following factors using multiple regression analysis:

    a) Dependent Variable: AF GAO-Protests Processed for a particular year

4

b) Independent Variable (Quantitative): AF Contract Actions

c) Independent Variable (Quantitative): AF Contract Dollars

d) Independent Variable (Quantitative): AF-GAO Sustain Rate

e) Independent Variable (Quantitative): General Economic Conditions

f) Independent Variable (Qualitative): Acquisition reform (CICA, FASA, FAR 15)

Further description of the coding mechanism and multiple regression techniques will appear in the Methodology Chapter.

Scope and Limitations

This research focuses on the protests filed at the General Accounting Office (GAO) during the post and pre award stage of Air Force contracts (hereby referred to as Air Force-GAO Protests Processed). It tracks and analyzes the number of protests filed from 1984 to 1998 as related to CICA, FASA, and the FAR 15 rewrite. In addition, the number of contract actions, contract dollars, GAO sustain rate, and the unemployment rate are compared to the respective year. From the data, the research attempts to determine the effects of the listed variables and assesses statistical correlation and relationships.

The study involves quantitative analysis. The purpose is to provide a broad statistical analysis of the number of Air Force-GAO Protests Processed as correlated to the variables. To ensure the validity and accuracy of the data, SAF/AQC has provided the guidance and numbers used in the study. A primary purpose is to determine if acquisition reform initiatives make a statistically significant impact on the number of

5

protests filed. Since multiple regression analysis is used, extreme caution is exercised in interpreting the results of the analysis. Correlation is not causation; therefore, the results are limited to the appropriate level of meaning for this type of statistical analysis.

Summary

This chapter provided a general overview of the bid protest process and changes related to acquisition reform. In addition, it introduced other external factors that may influence the likelihood of a contractor filing a protest. Most importantly, the chapter stated the research problem, importance, management questions, research objectives, scope and limitations of the study. The next chapter reviews the literature that explores the evolution of the bid protest process as related to acquisition reform, previous research efforts in the bid protest area, and justification for the use of stated external factors. Chapter III, Methodology, explains the data collection and quantitative analysis methods used in this research. Chapter IV consists of the data analysis. Chapter V synthesizes the results to draw meaningful conclusions for the AF decision-maker and suggest future areas of study.

II. Literature Review

Introduction

This chapter reports and investigates literature in the area of the bid protest process, reform of the acquisition laws as related to bid protests, costs associated with protests, and other factors that may influence the number of protests. A definition of key terms related to the bid protest process is followed by an in-depth analysis of the evolution of laws and regulations that govern the process. The chapter reports the strengths and weaknesses of previous research in the bid protest arena. Another paradigm related to acquisition reform's effectiveness is introduced to uncover potential variables (contract actions, contract dollars, GAO sustain rate, unemployment rate) that may influence the decision to protest. The chapter concludes with a focus on the current study.

Protests Defined

A substantial part of the procurement process, contract award controversies between government agencies and offerors, prospective offerors, and other parties, often lead to formal protests (Cibinic and Nash, 1998: 1481). According to the Federal Acquisition Regulation (FAR), a protest "means a written objection by an interested party to any one of the following:

> (a) A solicitation or other request by an agency for offers for a contract for the procurement of property or services.
> (b) The cancellation of the solicitation or other request.
> (c) An award or proposed award of the contract.
> (d) A termination or cancellation of an award of the contract, if the written objection contains an allegation that the termination or cancellation is based in whole or in part on improprieties concerning the award of a contract. (FAR 33.101)

7

Only protests submitted by an "interested party" that relate to a particular solicitation or the proposed award or award of a particular contract will be heard by the Comptroller General (Cibinic and Nash, 1998: 1496). Regarding a protest, the FAR defines an interested party as the actual or prospective bidder/offeror whose direct economic interest would be affected by the agency's contract award or failure to award (FAR 33.101). To allege a direct economic interest, the actual or prospective bidder/offeror must be next in line for award or be competitive for award if their protest is sustained (Cibinic and Nash, 1998: 1498). A protest can be "sustained" or "denied" by the GAO or agency, or withdrawn by the contractor.

The bid protest system exists in the unique area of public sector procurement to protect the integrity of the procurement process and safeguard protestor rights (Cantor, 1997: 155). Since the government is often the largest and only buyer in certain markets and public/private sector differences, the bid protest system imposes a unique set of rules on the contractors (Cantor, 1997: 155). The protestor faces a number of forums to obtain relief: the General Accounting Office (GAO), a federal district court, the Court of Federal Claims, or the procuring agency. The GAO, the oldest of the forums, has developed into the most popular choice for the protestors (aside from agency procedures) and has resolved the greatest number of protests in comparison to the other forums (Cantor, 1997: 158).

While the protestor may file with the agency or GAO, the interested party is encouraged to seek resolution with agency before filing to the GAO (FAR 33.102). Clearly, protests to the agency are encouraged to reduce the formality, costs, complexity, and time in a fair resolution of the dispute. On the other hand, the protests to the GAO

may involve a statutory stay of award, increased costs, a higher level of formality, and rigid time constraints. For these reasons, the research will focus on the Air Force-GAO Protests Processed.

Monetary and Nonmonetary Costs

At the beginning of the protest process, the "statutory stay" provision delays award or suspends contract performance pending a decision on a protest. If filed before contract award, the protest precludes the award of the contract until the matter is resolved. If filed after contract award, the protest will cause the federal agency to "immediately direct the contractor to cease performance under the contract" (Cibinic and Nash, 1998: 1506). Consequently, Air Force agencies will be forced to devote resources to resolve the protest and experience a delay and risk cancellation of the procurement. This study will cover both the preaward and postaward protests filed at the GAO on AF acquisitions.

In addition to the wasted resources and threat to the procurement, the protest can result in other nonmonetary remedies. The Comptroller General may recommend that the Federal agency: (1) refrain from exercising options on a contract, (2) recompete the contract, (3) re-issue the solicitation, (4) terminate the contract, (5) award a contract consistent with statutory requirements, and/or (6) implement a combination of the listed measures (Cibinic and Nash, 1998: 1529). Each of these nonmonetary remedies would cause a great deal of opportunity cost to the AF agencies in reaccomplishing and/or canceling preaward activities.

With regard to monetary remedies, the GAO may determine that the agency pay

the following costs as delineated by the FAR:

> [Government may pay] the cost, exclusive or profit, of filing and pursuing the protest, including reasonable attorney, consultant, and expert witness fees, and bid and proposal preparation costs. The agency shall use funds available for the procurement to pay the costs awarded. (FAR 33.104)

Since the actions of a *disgruntled bidder/offeror* may result in the payment of money,

agencies must identify the factors and circumstances conducive to the filing of a GAO

protest.

Competition in Contracting Act of 1984 (CICA)

Until 1984, The General Accounting Office (GAO) was the only forum for

disappointed bidders/offerors to lodge contract protests against government agencies

until. The Comptroller General issued decisions under the statutory authority of 31

U.S.C. which allowed for the settlement and adjustment of "accountable officers" and

decisions concerning the "legality of payments" (Cibinic and Nash, 1998: 1491). As the

procurement agencies generally agreed with the decisions, the GAO Protest Processing

mechanism became established in the system.

The informal system accepted by contractors and government agencies

encountered a watershed in 1984. In that year, the Comptroller General was given direct

statutory authority to hear protests and order a stay of performance (Cibinic and Nash,

1998: 1492). Congress enacted the General Accounting Office (GAO) as part of the

Competition in Contracting Act (CICA) in 1984. These major changes to the

administrative bid protest system took effect on April 1, 1985 (Coburn, 1985: 47). The

10

new law addressed perceived deficiencies in the GAO bid protest remedy: (1) denial of relief for meritorious protest, (2) lack of stay of contract performance, and (3) lengthy GAO review process (Coburn, 1985: 48). In addition, CICA gave contractors substantial new grounds to protest contract award (competition requirements, advertising requirements, defective specifications) (Coburn, 1985: 54).

In addition to the full and open competition requirement imposed upon the agencies, the contractors achieved a great degree of power in their quest for federal dollars. As an interested party, a perspective bidder could file a protest and delay the award of a federal contract until the issue is resolved. A prominent contract attorney displayed the general attitude prevalent after the enactment of CICA:

> Protesting an improper bid award demonstrates to the awarding agencies that they must play by their own rules. One thing is certain in dealing with government agencies: If they have learned you'll accept being treated unfairly without a whimper, they'll do it as often as they wish....each time you fight, no matter what the result, the next award is more likely to be given to your company. (Garofalo, 1990: 95)

At the cost of a postage stamp, contractors were able to exercise their right to protest on substantial new grounds under CICA. The failure to adhere to the time advertisement requirement for a solicitation or meet the criteria to clearly describe agency needs in the Commerce Business Daily (CBD) could warrant a protest. Secondly, an agency had to "specify its needs and solicit bids and proposals in a manner designed to achieve full and open competition for procurement" (Coburn, 1985: 54). Next, an agency failure to comply with the statutory limits on establishing or forcing bidder qualification requirements would be grounds for a protest (Coburn, 1985: 54). Finally, the failure of a procuring agency to act on the recommendation of the Small Business Administration

11

(SBA) representative to broaden a competitive procurement could bring a protest (Coburn, 1985: 54). Along with the traditional grounds for protest, these new issues would test the constitutional limits of CICA and discover if the full and open atmosphere would result in fewer protests.

Federal Acquisition Streamlining Act of 1994 (FASA)

Many acquisition professionals and lawmakers consider the Federal Acquisition Streamlining Act of 1994 (FASA) to be the most far reaching statutory change in the bid protest process since CICA. The Federal Acquisition Streamlining Act (FASA), enacted October 13, 1994, represents the first significant statutory change in the bid protest process since CICA (Adelson, 1996: 5). FASA imposed a requirement for more substantial post-award debriefings for unsuccessful offerors, provided for the use of protective orders, and changed the way critical time limits were handled (Adelson, 1996: 6). In response to numerous industry complaints, a major tenant of the law secured the rights of disappointed offerors to obtain a full and prompt explanation of why they were not awarded a contract (FASA Guide, 1995: 1-4). Also, the new law showed Congressional discontent with the GAO and GSBCA procedures in handling protests (Adelson, 1996: 5).

In the area of postaward debriefings, the law made four important changes. First, disappointed offerors must be notified of an award within 3 days of contract award. Secondly, awards made based on competitive proposals require unsuccessful offerors to request a debriefing within 3 days of notice of award. Next, this debriefing must be provided (to the maximum extent practicable) within 5 days of agency receipt of the

12

request. Finally, the debriefing must contain certain minimum requirements (overall rankings of offerors, rationale for award, reasonable responses to questions, significant weaknesses of disappointed offerors' proposal explained) (FASA Guide, 1995: 1-5). The overall intent of the new debriefing requirements was to provide the disappointed offerors with timely and relevant information regarding their proposal. Lawmakers hoped that this would eliminate the number of protests filed in order to gain information concerning the basis of contract award to reduce the nonmonetary and monetary costs associated with a protest (FASA Guide, 1995: 1-5).

FASA ushered in changes to the time limits and procedural processes involved in filing a protest. While the formal rules and strict deadlines have always been present, FASA offered a new degree of flexibility and put a greater degree of responsibility on the protestors to understand the time limits (Adelson, 1996: 8). FASA retained the rule that the protestor had 10 days from the date the basis of protest is known to file a protest; however, the GAO implemented the rule by giving protestors 14 calendar days (Adelson, 1996: 8). About a suspension of a procurement, FASA attempted to remove the incentive to protest to stop a procurement. It allowed the GSBCA to dismiss a "frivolous" or "bad faith" protest and linked the 10-day protest limit to the period following the postaward debriefing (Adelson, 1996: 9).

With the dissolution of the GSBCA and procedural changes in the GAO, contractors were faced with new rules and regulations that balanced fairness and efficiency in the bid protest process (Fausti and Lee, 1997: 10). President Clinton issued an executive order that encouraged bidders to file their protests with the agency awarding the contract as opposed to the GAO. If the issue could not be resolved at the agency

13

level, the contractor could still refile the protest at the GAO. In an effort to expedite the process, the GAO is required to issue a decision on the protest no later than 100 days after the protest is filed (Fausti and Lee, 1997: 11). A streamlined and efficient protest system that discouraged frivolous protest in a new *open atmosphere* with contractors should have affected the number of protests filed.

FAR 15 Rewrite (1997)

The FAR Council tasked an ad hoc interagency committee to rewrite FAR 15, Contracting by Negotiation in January 1996 and the final rule became effective on 10 October 1997 (Federal Register, 1997: 51224). The goals of the rewrite were to incorporate innovative techniques in the source selection process, simplify the process, and facilitate acquisition of the "best value" (Federal Register, 1997: 51225). To attain these goals, the FAR 15 rewrite ushered in a series of changes that expanded the need for Contracting Officer judgement in the equitable treatment of contractors.

Prior to the FAR 15 rewrite, the standard rule for competitive range determinations was "when there is a doubt as to whether a proposal is in the competitive range, the proposal should be included" (Federal Register, 1997: 51227). Consistent with the Clinger-Cohen Act of 1996, the revision indicates that Contracting Officers should establish a competitive range of the most "highly rated proposals" (Federal Register, 1997: 51229). The objective of the changes were twofold: 1) contractors with a good chance of winning the contract would compete more aggressively, and 2) those eliminated from the range would avoid wasting resources in a futile effort (Federal Register, 1997: 51229). Contracting Officers gained increased flexibility on the

14

competitive range determination; however, they needed to follow reasonable and fair methods to make such a determination. Arbitrary exclusions from the competitive range and inconsistent application of competitive range criteria would lead to contractor protests.

The FAR 15 rewrite introduced "efficient competition" as the guidance to apply the criteria for advancing into the competitive range (SAF/AQC, 1998). While the final rule did not provide an exact definition of efficient competition, it allowed for the facts of the "instant acquisition" to apply (Federal Register, 1997: 51227). The FAR describes the process for limiting the competitive range for the purpose of efficiency; however, the contracting officer is free to exercise authority in a variety of circumstances (Federal Register, 1997: 51229). The new "when in doubt, throw them out" rule could provide a level of discretion to contracting officers that could lead to abuse. Offerors might be excluded from the competitive range for arbitrary reasons unrelated to the actual procurement (ad hoc blacklisting, etc). The power to reduce the number of proposals in the competitive range to the "greatest number that will permit an efficient competition among the offerors rated most highly" could lead to an increase in the number of protests filed.

The FAR 15 rewrite also brought significant changes in the types of exchanges and communications between the Government and contractor. Negotiations gave the offeror an opportunity to revise their proposal using bargaining, persuasion, and give and take after establishing the competitive range. The rule contains limits on exchanges that preclude favoring one offeror over another, revealing offeror's technical solutions, revealing prices without the offeror's permission, and knowingly furnishing source

15

selection information. Expanded exchanges allowed robust discussions having offeror revisions causing the relative positions of offerors to change. Increased exchanges with industry increases opportunity for unfair competitive advantage or disclosure of a potential offeror's confidential business strategy.

Acquisition Reform and Protests: The Alternate View

Acquisition reform initiatives have attempted to increase competition and enhance Government-contractor communication while giving the contracting officer increased autonomy. In an effort to foster good will, many of the reform efforts have attempted to address the reasons influencing contractor protest. Much research and data relating to the official reasons behind a protest have been published. On the other hand, there appears to be a lack of research regarding the influence of acquisition reform (and external factors) on the number of protests filed in the Air Force.

The acquisition reform initiatives have focused on modifying the behavior of the buyer (government agency) in an attempt to improve the entire process (Dews and Berkler, 1983: 2). Lawmakers believe that adopting commercial practices, providing a thorough debriefing, and stating requirements in a way to provide full and open competition will reduce the number of protests. This assertion is based on the assumption that the protest will always be caused by an alleged impropiety by the agency or a lack of full communication with the contractor. The fact remains that a number of disappointed bidders will file a protest based on conditions outside of the control of the agency. Laws and regulations imposed upon the agency have made a legitimate effort to improve the relationship with federal contractors by streamlining the protest process and

enhancing competition. The issue arises: have the lawmakers reached a point of "leaving well enough alone with the bid protest process?" (Cantor, 1997: 155).

Cantor contends that several recent reforms streamlined the bid protest system by clarifying jurisdictions, discouraging frivolous protests, and eliminating certain forums (i.e. GSBCA) (Cantor, 1997: 156). Former Office of Procurement Policy Administrator Steve Kelman asserted that these reforms were part of a larger effort by the Government to move toward "value oriented" and "streamlined competion" (H.R 1670 Hearings). Cantor acknowledges these goals as legitimate; however, he points to a shift from fairness to efficiency (Cantor, 1997: 157). CICA is viewed as a step toward full and open competition to promote fairness; however, FASA and other reforms of the 1990s are seen as restrictive to the process (Cantor, 1997: 157). Cantor is concerned that a "sanctioning of frivolous protests" and a consolidation of bid protest forums will discourage a disappointed bidder from filing a protest. This research will attempt to discern a correlation between the changes in protests resulting from CICA as compared to the reforms of the 1990s.

Previous Research

Lieberman conducted a study of protests filed in different forums over a three-year period and classified the following three major categories: (1) improper actions in evaluation and negotiation of proposals, (2) improper actions involving solicitations or requirements, and (3) improper restrictions on competition (Lieberman, 1995: 11-19). These official reasons were labeled the "top three reasons"; however, no evidence is given regarding probable causes of the trends.

17

Cantor presented the results of the American Bar Association's Acquisition Law Advisory Panel assembled to evaluate bid protests related to procurement reform. The committee recommended the consolidation of judicial protests and recognized the sanctioning of frivolous protests (Cantor, 1997: 170). Cantor warns that monetary sanctions and *streamlining* the bid protest process in the interest of efficiency have a *chilling effect* on the amount of protests filed (Cantor, 1997: 176). He predicts a reduction of protests because of the acquisition reform of the 1990s; however, there is a lack of empirical evidence in the study. Cantor's conclusions were based upon a review of court cases and the history of the bid protest mechanism.

Two thesis efforts at the Air Force Institute of Technology in 1997 analyzed the effect of the impact of the Federal Acquisition Streamlining Act of 1994 on post-award protest frequency. Duncan concluded that that FASA resulted in a marginal decrease in the frequency of award protests (Duncan, 1997: 80). While Duncan describes the complex dynamics involved in this adversarial arena, there is a clear need to search for other factors. The effect of improved processes or new acquisition laws on the number of protests filed may be negligible in the face of such external factors as the size of the DOD budget and the general economic conditions.

Thomas focused on whether FASA changes in the post-award debriefing process resulted in fewer protests. His research did not involve quantitative analysis as he recommended the research to "serve as the basis for a future researcher to develop a quantitative study on the effectiveness of the post-award debriefing process" (Thomas, 1997: 90). He concluded that FASA improved the post-award debriefing process as less adversarial and more open based on interviews/surveys. He continued with this point in

stating that this atmosphere may reduce the likelihood that the unsuccessful offeror will file a protest. In summary, Thomas advocated the use of a statistical analysis with a larger sample to determine the impact of FASA changes on the post-award debriefing process on protest frequency.

Mintz used multiple regression techniques to measure a variety of political and economic variables on the number of contract awards per year (Mintz, 1992: 22). The statistical analysis provides a basis for measuring factors that may influence the number of contracts awarded during a year. In the same manner, this research will attempt to use multiple regression techniques to quantify the effects of a variety of independent variables on AF GAO-Protests Processed. Throughout the course of the literature review, the researcher did not uncover a multiple regression model to gauge contractor protests. On the other hand, a valuable multiple regression model (espoused by Mintz) can serve as the foundation for the methodology used in this thesis.

Other Factors Considered: Contract Dollars and Actions

Throughout the history of the United States, defense expenditures fluctuate in relation to times of crisis or apparent crisis (Gansler, 1980: 9). As funds flow in and out of the defense budget based on public opinion and world events, the level of defense procurement follows an extremely cyclical nature (Gansler, 1980: 9). Gansler analyzed the peaks and valleys of defense spending in the post World War II period. He concluded the erratic defense spending could be attributed to a sense of constant crisis or apparent crisis in the United States.

After being cut by almost 40% from 1968-1977, defense spending began to rise by a modest $10 billion in 1978 (OMB, 1991: 17). The historical perspective is valuable in understanding the nature of defense spending; however, this research will focus on the period 1984-1998. Between 1980-1988 (known as the Reagan "spending boom"), real outlays were increased by about $88 billion (54%) (OMB, 1991: 17). A series of stunning changes in the world during 1991 led to a sharp reduction in defense spending (Lall and Marlin, 1992: 9).

Given the huge military buildup of the 1980s, a significant number of layoffs among major defense contractors began occurring in 1989. McDonnell Douglas began to retrench in 1989 and announced plans to layoff 10,000 to 15,000 workers (Lall and Tepper, 1992: 9). In the era of a leaner DOD budget, could thicker competition and a quest for survival lead to an increased amount of protests? Alternatively, would the effect on the number of protests be negligible as the contractors avoided fostering ill will in the tough times, sought business in the private sector, or consolidated among themselves?

GAO Sustain Rate

In a 1995 study conducted by Lieberman, the results of protests filed in five different forums were compared to identify where a contractor would tend to have their protest sustained. The results indicated that a contractor would be two to three times more likely to obtain relief at the General Services Board of Contract Appeals (GSBCA) (Lieberman, 1995: 2). Overall, the GAO averaged around 12-13 percent sustain versus close to 40 percent for the GSBCA. Lieberman concludes that the substantial difference

in sustain rate in the different forums will be significant to contractors and government officials in light of the elimination of the GSBCA. Consequently, the overall lower sustain rate at the GAO might reduce the number of protests with the elimination of the GSBCA as a viable option.

Figures released by the GAO lend credence to Lieberman's study. The GAO's sustain rate has remained relatively constant throughout the 1990s between 11% and 13% (Gordon, 1998: 5). In addition, statistics released in early 1998 reveal a decline in bid protests by 18% below the previous year. Why do the protests appear to be falling? The Government Contractor contends that this could be the result of contractor consolidation, fewer contracts, fewer contract dollars, and the changes brought about by FASA (Government Contractor, 1998: 42).

At the Air Force level, the number of GAO protests has declined from a high of 493 in 1993 to 203 in 1998 (SAF/AQC). This reduction in the number of protests filed must be viewed in light of the sustain rate. While the protests filed have declined dramatically, the AF-GAO sustain rate has declined to around 2% in the late 1990s. Are the protest numbers falling because of less chance for relief at the GAO as Lieberman predicted? This research will use statistical tools in an attempt to answer these questions.

General Economic Conditions: Unemployment Rate

At the foundation of the impact of general economic conditions is the basic question: will economic "bad times" increase the likelihood of contractor protest? Classifying general economic conditions in terms of inflation, GNP, unemployment, etc. is a matter of gathering U.S. economic data. On the other hand, selecting a

macroeconomic variable applicable to this study requires further analysis. Mintz expanded on this problem in constructing his regression model when he concluded "specifying the appropriate economic trigger is difficult, particularly since the defense budget creates substantial economic effects of its own…[there are] a large numbe of economic variables" (Mintz, 1992: 22).

Mintz selected the unemployment rate as a quantitative variable in the statistical model of contract awards. When political leaders speak of the economic benefits of defense spending, there is a good chance they mean jobs in defense industry, created by large military installations and the like (Mintz, 1992: 22). Consequently, he relates the level of unemployment to public attitudes toward the economy and popularity of political candidates (Mintz, 1992: 22).

Beyond public attitudes toward the economy, high unemployment equates to low industrial productivity and inefficient use of industrial and social capital (Janorski, 1990: 1). Baumer and Van Horn label the unemployment rate as the "single most important signpost of a nation's prosperity due to the costs brought about by the reduced productivity" (Baumer and Van Horn, 1985: 1). The costs of unemployment can be quantified by realizing that a 1% rise in the unemployment rate deprives the federal treasury of approximately $25 billion in lost tax revenues and increased spending on social welfare programs (Baumer and Van Horn, 1985:1). Therefore, the nation's unemployment rate will provide a general measurement of the state of the economy for a particular year.

This study will not attempt to define what level of unemployment is considered good or bad because the answer to this question changes over time based on ideology and

partisanship (Baumer and Van Horn, 1985: 21). During the 1950s and 1960s, 4% was the widely accepted measure of acceptable unemployment levels; however, economists argued that the number should be revised to 6% (Baumer and Van Horn, 1985: 21). This researcher does not classify the unemployment rate against a baseline; however, an elevation in the unemployment rate may characterize increased negative condition in the national economy.

Federal contractors at the operational and systems level conduct business in the public and private sector. As business concerns, they are exposed to conditions in the national economy and make adjustments to ensure economic survival. During periods of negative condition in the economy (higher unemployment periods), federal contractors might behave more competitively to win an AF contract. In strained economic times, the disappointed bidder may file a protest with less provocation. On the other hand, perceived "bad times" could result in contractor behavior that avoids a conflict with the AF. Trends or shifts in the protest data associated with general economic conditions (unemployment rate) will be tested for statistical significance.

Focus of Current Study

This literature review confirms a lack of research accomplished to date that objectively measures the effectiveness of acquisition reform and/or external factors on the number of protests filed. On the other hand, the review led to the discovery of a political-economic model created to estimate contract awards based on a multitude of independent variables.

Mintz used a political-economic model of defense spending to predict contract awards using multiple regression techniques. Using a variety of qualitative and quantitative variables in a statistical model, he demonstrated how a major portion of defense spending (contract awards) fit into the broader picture of the American political economy (Mintz, 1992: 29). This study uses elements of the Mintz model as a basis and justification for using statistical tools in the research design.

This research attempts to determine the effects of acquisition reform initiatives, GAO sustain rate, contract dollars, contract actions, and general economic condition on the number of protests filed. Regression analysis will be employed to test the statistical significance of the multiple regression model's response and predictor variable(s). In order to make an accurate assessment of acquisition reform's effect on bid protests, the study will provide an objective look at protest trends and associated conditions to the Air Force. A historical analysis that culminates with statistical results may shed light on the utility of continued reforms in the bid protest arena. While the results of the research will not establish causal relationships, the statistical correlation provides Air Force decision-makers a tool to identify trends in contract protest frequency.

Summary

This chapter provided a review of literature on the bid protest process, reform of acquisition laws as related to bid protests, costs associated with protests, and other factors that may influence the number of protests filed. In addition, it provided relevant background information to frame the study in the appropriate context against other research in the area. The protest process and key terms were described in detail with

current trends in the numbers of protests filed. Changes in procedure and substance brought about by CICA and FASA were discussed as related to the current study. The discourse provided insight on other factors besides the acquisition reform initiatives that may influence the number of protests filed. The review brought the complexity of the decision to file a protest to light and its importance due to the nonmonetary and monetary costs associated with a protest.

Previous research has focused on the reasons that contractors file protest as opposed to the environmental factors that may influence their decision. While some qualitative approaches have been made to discern the effects of FASA and post-award debriefings, a broad statistical analysis has not been conducted in the Air Force regarding the other factors brought to light in the literature review. This study will use archival data and investigate changes in the numbers of protests filed over a 14-year period to discover statistical significance. Due to the passage of CICA and significant changes it imposed on the bid protest system, 1984 has been chosen as starting point for the analysis. The GAO forum has been selected as the point of investigation because of the vast amount of data maintained by SAF/AQC regarding this entity and overwhelming choice by contractors to use this mechanism.

How have the acquisition reforms affected the number of AF GAO-Protests Processed? Have the number of contract dollars and actions affected these numbers in conjunction with the reforms? Does the GAO sustain rate have a statistical impact on the numbers of protests filed in the AF? Does general economic condition (i.e. unemployment rate) have an impact on the numbers of protests filed in the AF? The

existing research has not adequately addressed these questions. The next chapter focuses

on the research methodology employed to address these issues.

III. Methodology

Introduction

This chapter describes the research procedures followed to meet the objectives outlined in Chapter 1. A discussion of the qualitative and quantitative research paradigms concludes with a justification of the method selected for the current study. The hypotheses tested and ex post facto independent variables are explained. Next, the study lists the benefits and shortcomings of the Mintz multiple regression model adapted for use. The time-series analysis is introduced as a potential method to control for the pitfalls of internal validity associated with multiple regression in this study. The discussion of the time-series analysis and regression analysis concludes with the selection of the appropriate method for the study. Lastly, the researcher provides the method for managing and recording the data.

Quantitative and Qualitative Research

The fundamental approach to answer the research question is grounded in the two paradigms—quantitative and qualitative. Beyond the philosophical base of the research, the paradigms have an intrinsic link to the type of methodology selected for the study (Cook and Reichardt, 1979: 11). The paradigms exist on a continuum that overlaps in certain realms to aid the researcher in the pursuit of knowledge in a scientific endeavor.

Firestone classifies the quantitative and qualitative paradigms in four areas: assumptions, purpose, approach, and researcher role. The quantitative approach seeks out an objective reality with facts; however, the qualitative approach sees a socially

constructed reality. While the quantitative researcher attempts to discover causes and relationships, the qualitative researcher seeks understanding. Quantitative research tends to be characterized as experimental and correlational; whereas, qualitative research is often labeled as a form of ethnography. In summary, the qualitative research approach is used when observing and interpreting reality with the aim of developing a theory that will explain the phenomena. The quantitative approach begins with a theory/hypothesis and "tests for confirmation or disconfirmation based on the data" (Newman and Benz, 1998: 2-3).

While theoretical debate continues about the paradigms and associated methods, practical research recommends a decision based on the "best or most logical link between the paradigm and method" (Cook and Reichardt, 1979: 17). A guide in selecting the appropriate method is best summarized as:

> Researchers who use the qualitative methods do subscribe to the qualitative paradigm than to the quantitative paradigm. Similarly, there is a correlation between the use of quantitative methods and adherence to the quantitative paradigm (although these linkages between paradigm and method are not always perfect, as many seem to believe). (Cook and Reichardt, 1979: 17)

Cook and Reichardt conclude that the most important distinction to aid in the selection of a paradigm and method is the dimension of verification versus discovery. Quantitative methods verify or confirm theories/hypotheses and qualitative methods seek to discover or generate theories.

The specific methods associated with the qualitative paradigm fall under the heading of ethnography. They consist of case studies, field studies, grounded theory, and descriptive studies (Creswell, 1994: 11). Quantitative methods, characterized as

28

empirical or statistical, include experiments, surveys, and generalizing from a sample to a population (Creswell, 1994: 11).

The respective paradigms coexist in a complimentary relationship with each other. Newman and Benz contend that the place of theory overlaps in the world of the quantitative and qualitative researcher. The qualitative researcher is motivated by "theory building" and the quantitative researcher is motivated by "theory testing;" however, each depends on the other to cover the research realm (Newman and Benz, 1998: 20). For clarification, Figure 1 has been inserted on the following page adapted from Qualitative-Quantitative Research Methodology. Figure 1 shows the location of the "theory" at neither the beginning nor the end of the Newman-Benz model. The circles represent the qualitative researcher and the squares symbolize the quantitative researcher on the model. The squares within the circles illustrate the overlap between the two paradigms that characterize the complimentary relationship.

Following the cycle in Figure 1, the qualitative researcher approaches the topic with an inductive approach. Data is gathered regarding the item to be measured (Circle A) using the methods described earlier. The researcher continues through the A-B-C-D-E process in an effort to produce a theory (Circle E). The quantitative researcher begins with the Theory (Square 1) and deductively follows the 1-2-3-4-5-6 path in the figure to derive conclusions and recommendations. The dotted-lined box surrounding Theory 1 and Theory E represents the point at which the quantitative-qualitative gap is closed and the cycle is complete. Newman and Benz formulated this model to illustrate the value of a holistic view of the two paradigms and their value to the researcher.
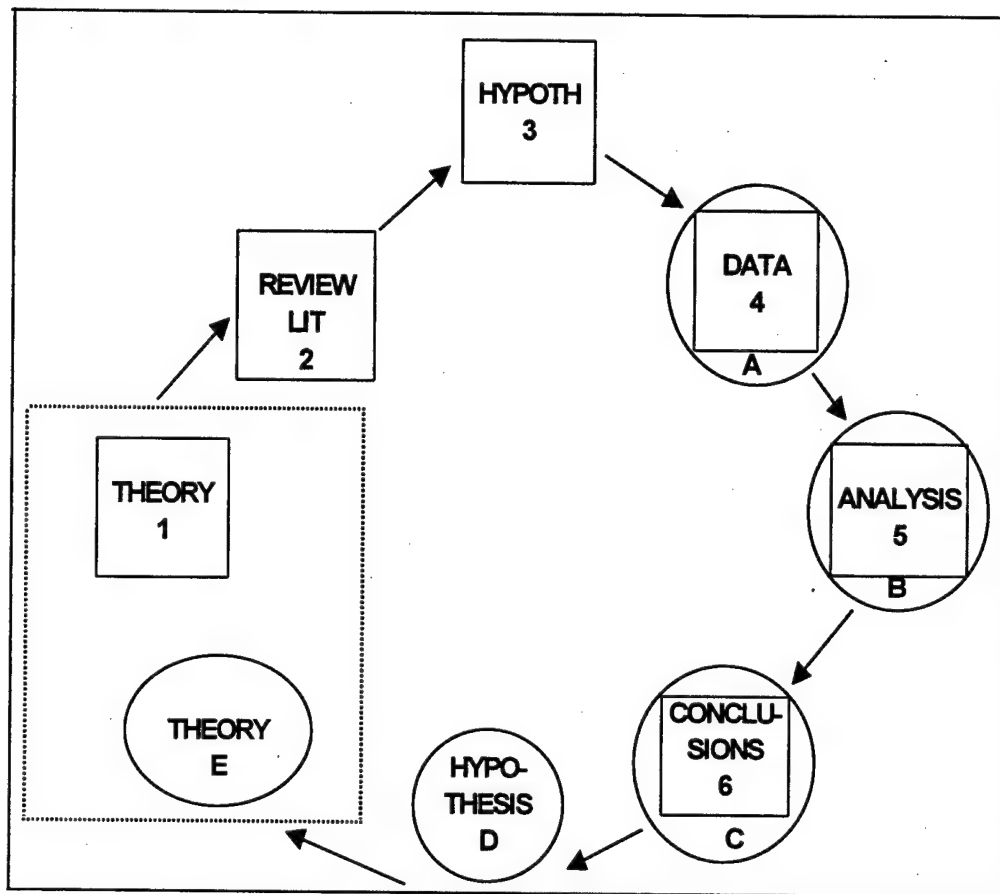
Figure 1. The Qualitative-Quantitative Philosophy of Educational Research (Newman and Benz, 1998)

The Appropriate Method

In selecting the appropriate method for the study, the researcher must always

consider the ultimate goal: the most effective way to search for knowledge (the "truth")

(Newman and Benz, 1998: 11). Instead of advocating a particular paradigm as a

universal approach, the selection must serve to answer the research question. On a practical level, the researcher must consider: (1) the nature of the research question, (2) accessibility of the data, and (3) whether the data are quantified according to the design of the study.

In this study, the nature of the research question and background information lend itself to quantitative methods. The research seeks to discover correlation and statistical relationships between the number of protests filed (dependent variable) and acquisition reform initiatives, GAO sustain rate, contract dollars and actions, and general economic condition (all independent variables). The literature review presents a number of theories espoused by previous research and experts in the acquisition field on the research question.

Secondly, archival data exists at SAF/AQCX to track the relationship over the relevant 14-year period of the study. In this study, there is no need to employ ethnographic methods associated with the qualitative paradigm. In addition, the researcher is detached from the data to compose an objective analysis based on statistical procedures discussed later in this section.

The data collected from SAF/AQCX has been quantified according to the research design. In addition, the study assigns a number to the variables for the application of statistical methods.

Selection of Quantitative Research Design. After an analysis of both paradigms and associated methods, a quantitative research design is most appropriate to address the research question. In this study, reality is singular and apart from the researcher as required by the quantitative paradigm (Creswell, 1994: 5). As archival data analysis and

31

statistical techniques are used, the researcher is independent of the number of protests filed (dependent variable). Every effort has been made to ensure that all research will be conducted free of bias and value consistent with the quantitative view (Creswell, 1994: 5). The goal of the research is to determine the existence of a relationship/correlation between the dependent and independent variables for the use of AF decision-makers. Conclusions and recommendations exhibit the appropriate degree of tentativeness and generality for the study.

Propositions and Hypotheses

The following propositions and hypotheses are proposed for the study:

Proposition #1. Chapter II discusses the peaks and valleys in defense spending associated with the post World War II period and how procurement follows the cyclical nature of the DoD budget. In this manner, the 1980s saw an increase in contract awards/dollars and the 1990s saw a dramatic decline in these variables. In a lean defense contracting environment, the issue arises whether or not the contractor would be more likely to fight for the federal dollar. In other words, does vying for a smaller pool of DoD dollars lead to an increased number of protests? On the other hand, a protest may foster ill-will between a contractor and AF Agency. Would a contractor be willing to risk deteriorated relations in a time of defense cutbacks of federal contracting dollars? This study contends that an increase in AF Contract Dollars and AF Contract Actions may actually decrease the number of protests as more contracts would be awarded. Consequently, the larger pool of contracts would quell the tendency to file protests. **The**

number of AF contract actions and contract dollars have impacted the AF-GAO protests filed in a manner that would significantly alter the number of protests.

> H_1: An increase in the number of AF contract actions will decrease the number AF GAO-Protests Processed from 1985-1998.

> H_2: An increase in the AF contract dollars will lead to a decrease in the amount of AF GAO-Protests Processed.

Proposition #2. Chapter II introduces Lieberman's comparison of protests filed in five different forums to identify where a contractor would most likely have their protest sustained. Lieberman's study points this research to an investigation of the relationship between the GAO sustain rate and the number of protests filed in this forum. On the surface, it appears that the GAO sustain rate has remained higher during periods of increased protest frequency and lower during periods of reduced protests frequency. **The GAO sustain rate has influenced the AF-GAO protests filed in a manner that would significantly alter the number of protests.**

> H_3: An increase in AF-GAO sustain rate can be associated with an increase in the number AF GAO-Protests Processed

Proposition #3. This proposition addresses the following question: will *economic bad times* increase the likelihood of contractor protest? Chapter II discusses the Mintz model in relation to this variable and justified the selection of the unemployment rate as an adequate barometer of the economy for a period. This study contends that periods of relative prosperity and *good times* in the economy (signified by a decrease in the unemployment rate) will be associated with fewer protests. Conversely, a downturn in the economy (signified by an increase in the unemployment rate) will bring about an

33

increase in the number of protests. The perceived bad times may cause the contractor to battle for economic survival in the commercial and public sectors of the economy. **The unemployment rate (General Economic condition) has impacted the AF-GAO protests filed in a manner that would significantly alter the number of protests.**

H_4: Periods of higher unemployment can be associated with increases in the number of AF GAO-Protests Processed.

Proposition #4. Various acquisition reform initiatives have sought to streamline the procurement system, maintain fairness in the competitive process, and improve Government-Contractor relations. Procurement officials believe that the push for fairness and competition improvements will lead to a reduction in contractor protests. There has been a reduction in the number of AF-GAO protests filed during the late 1990s; however, the relationship to acquisition reform is largely untested. **This researcher asserts that acquisition reform initiatives have not affected the AF-GAO protests filed in a manner that would significantly alter the number of protests.**

H_5: The introduction of FASA and FAR 15 rewrite (efficiency changes) did not reduce the mean number of AF GAO-Protests Processed.

Sources of Data Analysis

The GAO-Protests Processed in the Air Force has been obtained for the period between 1984-1998. SAF/AQCX maintains electronic and paper data bases to track the number of protest filed in the Air Force at the GAO, the number of contract actions for the fiscal year, the number of contract dollars for the fiscal year and the GAO sustain rate of AF protests. The significant acquisition reform variables, classified by CICA ('84), FASA ('94), and FAR 15 rewrite ('97) are verified for coding through secondary data

sources. In addition, the study gauges general economic condition by the U.S unemployment rate.

Due to the nature of the independent variables, they are characterized as non-manipulatable. Since the independent variables are out of the control of the researcher, the research can be classified as ex post facto or correlational research (Newman and Benz, 1998: 41). Research design experts warn against the possible misinterpretation of research where there is no control over the independent variables. As this study is correlational research, the researcher and subsequent user of the results must be careful to remember that "correlation is not necessarily causation" (Newman and Benz, 1998: 41). In this thesis, one must take care in assuming that acquisition reform caused a reduction of protests. This is precisely why a number of variables have been introduced for study and comparison. In order to assume a causal relationship, the researcher must have internal validity with all other possible explanations for the effect on the dependent variable controlled.

The researcher acknowledges the lack of control in the ex post facto design; however, attempts have been made to address issues of the internal validity of the study. The independent variables cannot be manipulated because they have already occurred; however, the data can be analyzed over a time series to discover the statistical impact of the independent variable with respect to pre- and post- events. To address the self-selection of variables confound, the researcher selects the variables and derives the hypotheses from the existing body of qualitative research in the protest area. Every item tested in this study has been proposed and developed by previous researchers and not arbitrarily selected by the researcher.

In summary, ex post facto research is not appropriate for a research question dealing with causation. Since this research deals with relationships, the use of the ex post facto design is appropriate (Newman and Benz, 1998: 42).

Benefits and Shortcomings of Using a Multiple Regression Model

Instead of providing a mere correlation analysis, regression techniques provide an equation describing the nature of the relationship between the variables (Kachigan, 1986: 238). Secondly, regression analysis produces measures of variance that allow the researcher to assess the power of the chosen model for estimation and prediction. (Kachigan, 1986: 238). In summary, the formulation of the regression equation and subsequent analysis of variance elevate it above a "curve fitting technique" (Kachigan, 1986: 238).

In regression analysis, the dependent variable is always quantitative, but the independent variables may be either quantitative or qualitative. The way in which an independent variable enters the model depends on its type (nominal, ordinal, interval, ratio data) (McLave and Benson, 1998: 579). Mintz provides a useful model to measure contract awards versus a variety of independent variables (Mintz, 1992: 23).

This study applies regression analysis in the same manner that Mintz used the procedure to predict the number of contract awards in a particular year. The researcher adapts the Mintz Model to measure the number of AF protests filed as a function of the independent variables in the study.

36

The specifications of Mintz's statistical model adapted for the model of AF GAO-

Protests Processed follow:

$$y = \beta_0 + \beta_1(x_1) + \beta_2(x_2) + \beta_3(x_3) + \beta_4(x_4) + \beta_5(x_5) + \epsilon$$

where the following apply:
   y = AF GAO-Protests Processed during year (y)
   x_1 = AF Contract Actions
   x_2 = AF Contract Dollars
   x_3 = AF-GAO Sustain Rate
   x_4 = U.S. Unemployment Rate (General Economic Conditions)
   x_5 = Acquisition Reform FASA: 0 if CICA prior to FASA/FAR 15 rewrite
                                    1 if after FASA/FAR 15 rewrite

When conducting a multiple regression analysis, threats to the internal validity of

the study surface. McClave and Benson warn against the common pitfalls during the

testing and prediction phase: 1) parameter estimability, 2) multicollinearity, and 3)

prediction outside of the experimental region (McLave and Benson, 1998: 550-552).

Concerning parameter estimability, the data provides more than three independent and

dependent variables in the study. Since there are greater than three data points, a pattern

for regression may be established between the number of protests filed in the Air Force

and the independent variables over a 14-year period. In order to guard against

multicollinearity, the researcher pays special attention to the statistical outputs in the

regression analysis. If an independent variable has a VIF score above 100, it may be

overlapping/correlating with another independent variable. Finally, the study uses the

data in the regression analysis to make estimations within the relevant region (1984-

1998). If the model is extrapolated beyond this region, there is a risk of grossly

inaccurate predictions.

37

The Mintz model serves a useful purpose in providing a statistical foundation to analyze a contracting issue in terms of independent variables; therefore, this study uses the techniques in a similar manner. On the other hand, there are threats to the internal validity of the model that must be addressed. McLave and Benson point out the problem associated with using a regression model to analyze time series data (McLave and Benson, 1998: 553). As the observations occur sequentially in this study over a period of time (1984-1998), they may be correlated over time. In addition, the assumption of independent errors (fundamental to the use of regression) threatens to hamper the results if violated (McLave and Benson, 1998: 553). To overcome these problems, McLave and Benson suggest consideration of a *time series model* (McLave and Benson, 1998: 553). The next section explores the possibility of using the time-series model for this study.

Consideration of a Time Series Model

A time series consists of observations taken sequentially over time as opposed to the standard regression model where the order is irrelevant (Pole and others, 1994: 3). In this study, the data is spaced equally by the year associated with the number of protests filed. Pole points out the difference between time series analysis and forecasting by establishing "the construction of a suitable model based upon an analysis of the historical development of the series and information relevant to the series' likely future development" as the ultimate goal (Pole and others, 1994: 4). Time-series data eliminates hypotheses associated with a particular variable (i.e. GAO sustain rate, general economic condition); however, the causal connection is never demonstrated (Gottman, 1981: 45).

38

To describe the variation in the number of protests filed over the 14 year time series, the quantitative researcher might construct a model for the process that may have generated the data set. Time-domain models or frequency-domain models are available to apply this method to analyze the variation associated with the data (Gottman, 1981: 46). In this theoretical example, a variation in two sets of time-series sets could be established; consequently, one time-series may be used to forecast the other.

In addition, the quantitative researcher may employ the use of an interrupted time-series design to discern the effects of acquisition reform and general economic condition. In the study, the number of protests is the dependent variable being studied over time (yt). The intervention variables (x_1 and x_2) represent the changes imposed on the time series (interruptions). The intervention of acquisition reform and the general economic conditions could be modeled and analyzed for a relationship in this stochastic model.

On the surface, the time-series data analysis appears to yield the most accuracy and validity; however, additional investigation uncovers the obstacles that block its implementation in this thesis. Gottman issues a warning about the practical issue of power in a time series analysis:

> If a graduate student were to propose a dissertation employing a two-group analysis of variance, but said that he or she planned to use only three subjects in each cell, there had better be a good reason for doing that, because such a study would have little power to detect differences between the means. (Gottman, 1981: 58)

Gottman acknowledges that time-series analysis is possible with few data points; however, he describes this undertaking as "risky business" that leads to insignificant results based on insufficient data (Gottman, 1981: 59). In summary, the time-series

39

analysis requires a greater number of data points to fit a model than are available for this research.

Kendall cites examples of an appropriate time-series design: analysis of yields of barley over a 55 year period and miles flown by an airline for 96 months (Kendall, 1973: 9). In both examples, the time of observation and period covered would provide sufficient data points to establish trends/long term movement, fluctuations about the trend, and a seasonal component. In this study, the number of protests collected over a 14-year period do not provide an adequate number to provide meaningful results using the time-series analysis.

Selected Approach

After a careful comparison of both procedures, the **multiple regression** approach meets the objectives and conditions for this study. The use of this method best suits the problem of whether AF contract protest frequency rises or falls with the independent variables. A discussion of the specific method of data collection and procedures follows in the next section.

Managing and Recording Data

The study organizes the pertinent data collected from SAF/AQCX and secondary data sources with an organized approach advocated by Creswell. A guide to the specific procedures to focus the data collection are summarized as follows (Creswell, 1994: 152):

a) *Parameters*: AF GAO Protests Processed '84 –'98, AF Contract
Actions/Dollars '84-'98, U.S. Unemployment Rate '84 – '98;

b) *Information Collected*: Number of GAO Protests Processed, AF Contracts Dollars, AF Contract Actions, and U.S. Unemployment Rate;

c) *Protocol*: Statistical records maintained by SAF/AQCX, U.S. Department of Commerce.

The parameters ensure a relevant and obtainable sample of AF contract protests for analysis in the study. Protests awarded during and after 1984 reflect the changes imposed by the Competition in Contracting Act (CICA) and the Federal Acquisition Streamlining Act (FASA) / FAR 15 rewrite. Before the 1980s, the bid protest operated under different laws and regulations changing the face of protests.

The data are presented in a time series format to show AF contract protest trends in relation to acquisition reform, the size of the defense budget, and general economic conditions. Since the standardized data is capable of being compared over successive time intervals, a longitudinal study will be undertaken (Miller, 1991: 21). Changes in AF contract protest trends may or may not be correlated to changes imposed by acquisition reform; however, there is a combination of factors contributing to the phenomena. There is inherent difficulty in looking at protests strictly in terms of acquisition reform. Contemporary approaches involve allowing for and expecting a number of different causes for a single event (Miller, 1991: 21). Consequently, the justification for using multiple regression analysis techniques in this study is complete.

Converting Raw Data to Variables. A dependent variable (y) is the item to be modeled and the independent variables (x) attempt to predict changes in (y). In this study, the dependent variable is the number of AF GAO-Protests Processed per year between 1984 and 1998. The independent variables are AF Contract Actions, AF

41

Contract Dollars, GAO Sustain Rate, Unemployment Rate (General Economic

Conditions), and Acquisition Reform (CICA or FASA/FAR 15 rewrite period). An

application of these independent variables will be discussed in this subsection.

AF Contract Actions consist of operations, systems, and logistics contracting

actions reported to SAF/AQC. These actions could be formal contract awards or

modifications; however, both expose the AF to potential contractor protest. The data will

be measured in terms of millions of actions and gauge the level of activity for a particular

year.

AF Contracting Dollars consist of operations, systems, and logistics dollars

reported to SAF/AQC for particular year. To analyze the AF Contracting Dollars

(measured in billions of dollars), an index number has been calculated and measured

against a base. An index number is a number that measures the change in a variable over

time relative to its value during a specific base period (McLave and Benson, 1998: 734).

In this study, 1992 has been selected to describe the relative changes in AF Contracting

Dollars using the following formulation steps:

1) 19XX Index Number = $\dfrac{\text{19XX Contract Dollars}}{\text{1992 Contract Dollars}}$ X 100

2) 19XX Index Number X 19XX Contract Dollars = 19XX Contract Dollars
(converted)

The AF GAO Sustain Rate represents the percentage of protests sustained out of

the total protests received for a particular year. SAF/AQC monitors the status of a GAO

protest; therefore, a data base of the amount of sustained protests will be obtained for

42

evaluation. This percentage answers the question: How many times were the AF contractors successful at the GAO forum?

The study measures general economic conditions with a single variable—the unemployment rate. The selection of this measure of the general economy is not meant to diminish other factors in macroeconomics (inflation, interest rate, GNP); the logic and reasoning behind this selection was outlined in Chapter II. The unemployment rate expresses the percent of the United States' non-institutionalized population over 16 years old that is not employed (GPO, 1992: 381). The study derives the data for this independent variable from the U.S. Department of Commerce as published in the Statistical Abstract of the United States.

To measure the impact of acquisition reform, the study codes variables to represent the period following the implementation of CICA (1984 to the present) and FASA/FAR 15 rewrite (1994 to the present). Chapter II describes the sweeping reforms of CICA in the bid protest process; therefore, this period represented *increased equity in the process*. FASA and the FAR 15 rewrite increased the level of judgment and business sense required in a streamlined acquisition process; therefore, they will be characterized together. Overall, the analysis provides a comparison between the perceived equity associated with CICA and efficiency associated with FASA/FAR 15 rewrite. A discussion of the coding mechanisms follows in the next subsection.

Regression Procedure: Constructing and Testing a Model

While the Mintz model provides a multiple regression model with qualitative and quantitative variables to measure contract awards, the researcher cannot simply insert

43

variables for this study. According to Mclave and Benson, proper model building involves developing a model that provides a "good fit" to a set of data (McLave-Benson, 1998: 578). Most importantly, the regression model must be built using a methodical approach to "approximate the true nature of the relationship between the mean response $E(Y)$ and the independent variables" (McLave and Benson, 1998: 578). Model building serves as the foundation of the success or failure of the regression analysis; therefore, much care is given to this area of the regression analysis. Figure 2 illustrates this study's approach to analyzing data, formulating a model, testing hypotheses, and obtaining results.

In Figure 2, the procedure begins by **gathering the data** in accordance with the Managing/Recording Data section of this chapter. Next, the researcher begins with a fundamental issue in data analysis: what types of variables are being analyzed? The classification of variables as quantitative or qualitative defines the limitations of their use and application to any statistical analysis. While the dependent variable will be quantitative, the independent variables may be either quantitative or qualitative (McLave and Benson, 1998: 579). Quantitative data can be measured on a naturally occurring numerical scale and qualitative data can only be classified into categories. Quantitative data contains two subclassifications applicable to this study: 1) interval data – measured on a scale, origin has no meaning, and 2) ratio data – highest level, origin (0) is meaningful (McLave and Benson, 1998: 12).
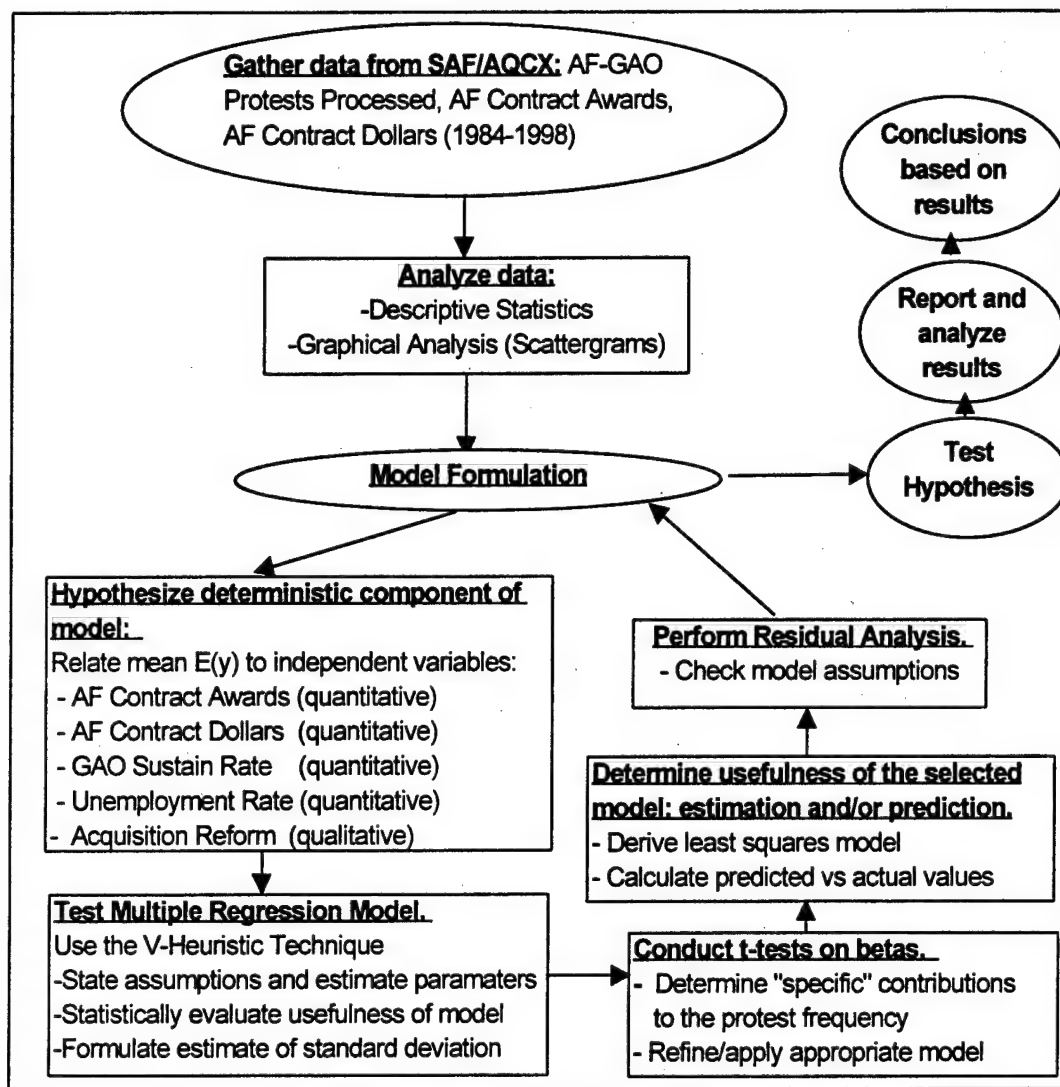
Figure 2: Study Procedure/Implementation Model (Based on guidance from McLave and Benson Chapters 11 and 12, 1998).

Qualitative data contains subclassifications applicable to this study: nominal/categorical data – code numbers that cannot be ordered or added/subtracted (McLave and Benson,

1998: 14). Chapter IV classifies the independent variables to their appropriate level for use in this study.

Following this classification, the researcher uses graphical methods to describe, summarize, and investigate patterns in the data. A time series plot for AF GAO-Protests Processed (horizontal axis) over the years 1984-1998 (vertical axis) has been constructed. From this plot, the researcher attempts to identify visual trends and movements in the dependent variable over time. While this may provide information regarding possible trends in the data, the researcher exercises care in making any judgments. The numerical methods employed in the descriptive statistic analysis are limited to the summary statistics related to AF GAO-Protests Processed between 1984-1998. The mean and standard deviation provide the average number of protests and variation over the years.

As part of the graphical analysis in Figure 2, the study constructs a series of scattergrams to determine the plausibility of a relationship between AF GAO-Protests Processed (y) and Contract Awards (x_1), Contract Dollars (x_2), the GAO Sustain Rate (x_3), or the Unemployment Rate (x_4) (McLave and Benson, 1998: 434). The researcher determines if a positive, negative, or no relationship exists between the dependent and quantitative independent variables.

Following the graphical analysis, the researcher codes the qualitative variable (acquisition reform) for use in the multiple regression model. With regard to the qualitative variable (acquisition reform), the study codes the data as appropriate in a tabular format. The CICA years prior to FASA/FARA are coded as 0 and the of FASA/FAR 15 rewrite years are coded as 1.

Use of Multiple Regression Techniques

Chapters I and II discuss the variety of factors that influence the likelihood of a contract protest; therefore, it is unlikely that a simple straight-line model provides a realistic probability model. Instead of using one predictor variable to estimate values on the dependent variable, multiple regression allows the use of several predictor variables (Kachigan, 1986: 259). The goal of this analysis is two-fold: (1) prediction the AF GAO-Protests Processed based on the independent variables, and (2) an assessment of the variance to which each independent variable accounts for in the dependent variable (Kachigan, 1986: 265). As the study proceeds to model formulation (as specified in Figure 2), the application of multiple regression techniques yield statistical results.

The first step is to hypothesize a model relating AF GAO-Protests Processed to the independent variables (AF Contract Actions, AF Contract Dollars, AF-GAO Sustain Rate, U.S. Unemployment Rate, Acquisition Reform). This step of the data analysis consists of formulating a general linear model for multiple regression as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 \in$$

Next, the study estimates the model coefficients based on the sample of AF GAO-Protests Processed (1984-1998). The study uses the JMP Statistical Software package to estimate the model coefficients based on the independent variables $(x_1, x_2, \ldots x_5)$. This procedure provides the estimated betas for the least squares model and the F statistic/P-Value to analyze overall model usefulness.

An integral part of the multiple regression testing in Figure 2 is the probability distribution of the random error component $(\in)$. Multiple regression procedures specify

that $\in$ is normally distributed with a mean of zero and a constant variance σ^2 (this study represents this assumption with the following symbolism [$\in \sim N(0, \sigma^2)$]). The data analysis chapter formulates an estimate of the variance (s^2) and the standard deviation using statistical methods. Consistent with the normality assumption, the study demonstrates that the majority of y values (AF GAO-Protests Processed) fall within 2s of the least squares predicted values.

The next step of the data analysis consists of determining the usefulness of the model in predicting protests. Useful does not necessarily equate to the best model; another model may prove more useful in terms of providing estimates that are more reliable. This study uses the testing heuristic described in the next section.

Testing Heuristic Used. The study uses the V-Heuristic to organize all hypothesis testing, state necessary assumptions, and make knowledge/value claims (Reynolds, 1998). The test is broken down as follows:

1. **State assumptions**. In this study, the following shall apply to model evaluation:

$$\in \sim N(0, \sigma^2)$$
$$\alpha = .05$$

2. **State null** (H_O) and **alternate** (H_A) hypothesis.

3. **Define the test statistic**. The F statistic and P-Value shall be used.

4. **State decision rule**. The criteria as related to the null/alternate hypothesis.

5. Input **data** and run the statistical software program (JMP).

6. Make **knowledge claim** based on the test statistic.

7. Make **value claim** regarding model usefulness based on evidence.

8. Conduct **aptness test** of the assumptions (Normality of Residuals).

48

Conduct t-tests on the Individual Betas. Once the usefulness of the multiple regression model is determined, the study measures the contribution of each independent variable on model usefulness. Since the major focus of the study is acquisition reform, this qualitative variable is subject to the first t-test. Following this test, the study measures the contribution of the four quantitative independent variables to model usefulness. The section culminates with a breakdown of the results of the hypothesis testing.

The Selected Model and Model Aptness. From statistical analysis, the researcher selects the model for estimation and prediction. Certain independent variables contribute to the usefulness of the model; however, statistically insignificant independent variables are removed from the model. The squared multiple correlation R^2 relays the portion of the variance of the dependent variable accounted for by all the predictor variables combined (Kachigan, 1986: 261).

From JMP Statistical output, the study derives the least squares model to predict values for comparison against the actual values of the dependent variable. These values provide the basis for the residual analysis and test of model assumptions (also described as the test of model aptness). The study tests the model assumptions with Wilk-Shapiro test of normality and a plot of the residuals.

Following the model aptness test, a breakdown of statistical results provides an objective summary of the multiple regression analysis. The data analysis supports the statistical claims for use in the conclusions/recommendations of this study.

49

Summary of Research Design

The methodology in Chapter III covers all research objectives with the proposed research design and data analysis. The research design attempts to identify trends in AF contract protests, the hypothesis testing for the multiple regression model, and the foundation for statistical knowledge claims. Chapter IV implements the study procedure and implementation model described in this chapter.

IV. Data Analysis

Introduction

Chapter IV presents the number of AF GAO-Protests Processed from 1984-1998 collected from SAF/AQCX. The first section identifies overall trends or patterns in the number of protests filed based on graphical representation and descriptive statistics. Next, a series of scattergrams between the dependent variable and the quantitative independent variables indicate the possibility of a relationship. The study moves to multiple regression analysis by presenting the necessary assumptions for the use of a model and hypothesis testing. Furthermore, specific t-tests of the qualitative variable (acquisition reform) and the four quantitative variables demonstrate their contribution to the model. Next, the study removes the statistically insignificant independent variables and conducts regression analysis with the selected model. The chapter concludes with a breakdown of statistical results on which to base conclusions and recommendations.

Analysis of the AF-GAO Protest Numbers (1984 to 1998)

A linear graph of AF-GAO protests in Figure 3 will be used to make observations about the general trends from 1984-1998. From 1984 to 1992, there appears to be stable period (albeit higher level) of contractor protests with little variability. In 1993, the number of protests jumps to nearly 500 for the year. Following 1993, protests appear to be following a sharp downward trend and ultimately reach the lowest level of 202 in 1998.

51

AF GAO-Protests Processed
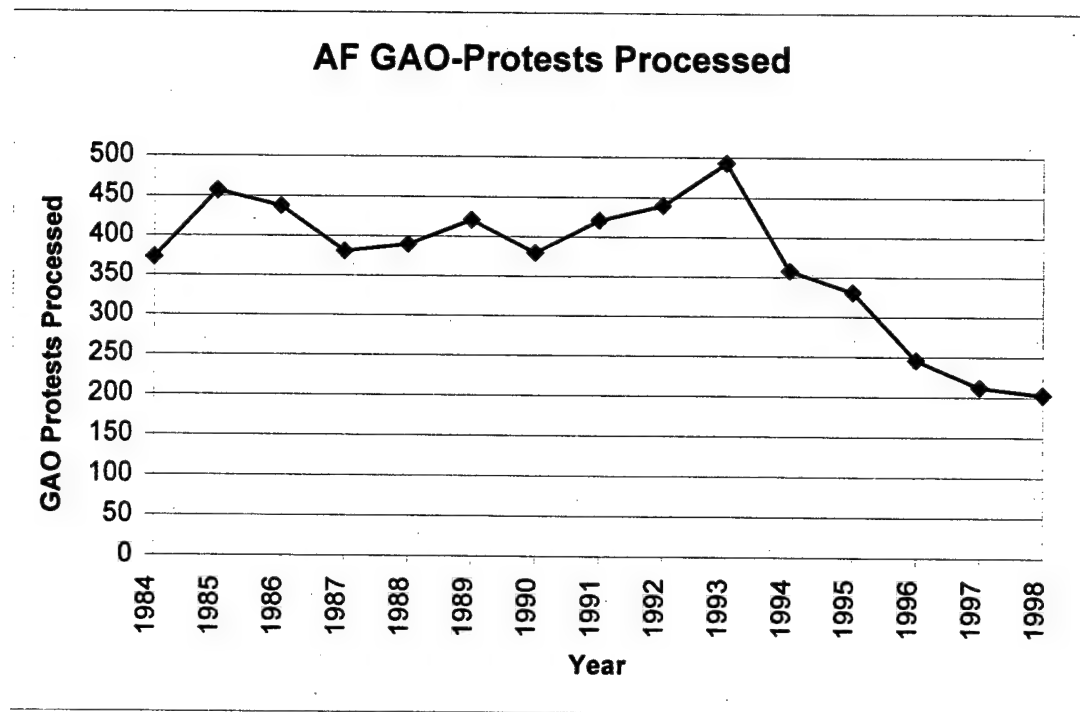
Figure 3: AF GAO-Protests Processed: 1984 to 1998

Table 1 provides the descriptive statistics for a deeper analysis of protest

frequency between the specified years. The researcher performs graphical and numerical

analysis to discern fluctuations about the mean relative to the standard deviation. The

mean number of AF-GAO Protests between 1984 and 1998 is approximately 370 with a

standard deviation of 88. In addition, the minimum value of the range occurs in 1998

(also two standard deviations outside the mean).

The Wilk-Shapiro test of normality results in a score of .90 (for the dependent

variable); this indicates that the number of AF GAO-Protests Processed follows an

approximately normal distribution. With this information, the researcher notes that

approximately 68% of the observations should fall within one standard deviation (1σ) of

the mean. Further analysis reveals that the following years (mainly affected by FASA/FAR 15 rewrite) fall outside of 1σ: 1993, 1996, 1997, and 1998.

Table 1. Protests (Descriptive Statistics) 1984 - 1998

Mean	369.6
Standard Error	22.6722
Median	381
Mode	421
Standard Deviation	87.8089
Sample Variance	7710.4
Kurtosis	-0.1209
Skewness	-0.8506
Range	290
Minimum	203
Maximum	493
Sum	5544
Count	15

The descriptive statistics provide measures of central tendency and dispersion of the dependent variable. Such measures allow the researcher to learn the tendencies of the distribution and highpoints/lowpoints of significance. From the descriptive statistics, this study concludes that:

- The AF GAO-Protests Processed follow an approximately normal distribution.

- Years outside of 1σ of the mean warrant further investigation.

- The years associated only with CICA produced a relatively stable distribution.

- AF GAO-Protests Processed have been following a downward trend since '93.

- 1993 marked the peak of protests filed and 1998 marked the low-point.

- Multiple factors may be responsible for the variation between the years.

The next section presents the a regression analysis of possible causes of variation.

Summary of Data Collected

SAF/AQCX and the United States Statistical Abstract serves as the source of data
for the dependent and independent variables. Table 2 represents a consolidation of the
data associated with the dependent and independent variables. The number of AF
Contract Actions and Dollars in 1984, 1985, and 1986 were unavailable for analysis;
however, all other data was obtainable. Table 2 expresses the AF Contract Dollars in
terms of '92 dollars (Chapter III specifies conversion method).

Table 2. Dependent and Independent Variables

PROTESTS	SUSTAINED	CONTRACT ACTIONS (in millions)	CONTRACT DOLLARS (in millions)	UNEMP RATE	ACQ REFORM
373	14	*	*	7.40%	No
457	24	*	*	7.10%	No
438	20	*	*	6.90%	No
381	39	5.106M	55.1M	6.10%	No
390	26	4.927M	53.7M	5.40%	No
421	13	5.556M	55.1M	5.20%	No
380	19	5.709M	54.4M	5.40%	No
421	21	4.933M	59.6M	6.60%	No
440	16	3.135M	40.6 (Base)	7.50%	No
493	8	3.008M	47.7M	6.90%	No
368	4	2.777M	43.2M	6.10%	Yes
331	7	2.546M	38.2M	5.60%	Yes
246	3	2.12M	41.6M	5.40%	Yes
212	5	1.719M	33.9M	4.70%	Yes
203	3	1.2M	30.7M	4.50%	Yes

<u>Graphical Analysis of Dependent/Independent Variables</u>

Prior to applying the multiple regression techniques, the study constructs a series of scattergrams to determine the relationship between AF GAO-Protests Processed (y) and Contract Awards (x_1), Contract Dollars (x_2), the GAO Sustain Rate (x_3), and the Unemployment Rate (x_4). The researcher determines if a positive, negative, or no relationship exists between the dependent and independent variables. In addition, the shape of the data in the scattergram indicates the likelihood of a linear or quadratic relationship.

<u>Single Quantitative Independent Variable #1: AF Contract Actions.</u> A scattergram below depicts the possible relationship between protests and contract actions. A visual inspection of Figure 4 reveals a possible relationship between the variables.

Figure 4: AF GAO-Protests Processed vs. AF Contract Actions Scattergram

The scatterplot suggests there is a general tendency for the number of protests to increase as the number of AF Contract Actions increase; however, the relationship may not be linear. When the number of actions approach 4 million, the number of protests experience a decrease.

Single Quantitative Independent Variable #2: AF Contract Dollars. The scattergram (Figure 5) presents the possible relationship between protests and contract dollars for analysis.

Protests vs. AF Contract Dollars
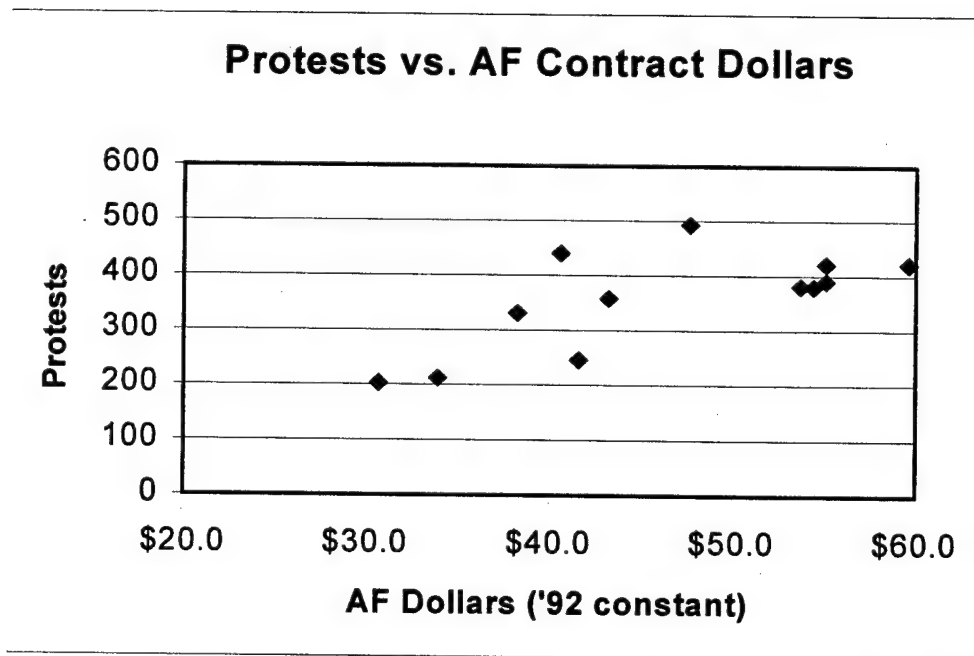
Figure 5: AF GAO-Protests Processed vs. AF Contract Dollars Scattergram

A visual inspection of Figure 5 reveals a possible relationship between AF-GAO Protests vs. AF Contract Dollars Scattergram the variables. The scatterplot suggests there is a

56

general tendency for the number of protests to increase as the number of AF Contract Dollars increases; however the relationship may not be linear. The number of protests increases in a linear manner up to $50 billion dollars; however, they experience a slight decline after this point.

Single Quantitative Independent Variable #3: AF-GAO Sustain Rate. The study presents a scattergram to analyze the possible relationship between protests and AF-GAO sustain rate. A visual inspection of Figure 6 does not reveal a clear relationship between the variables.
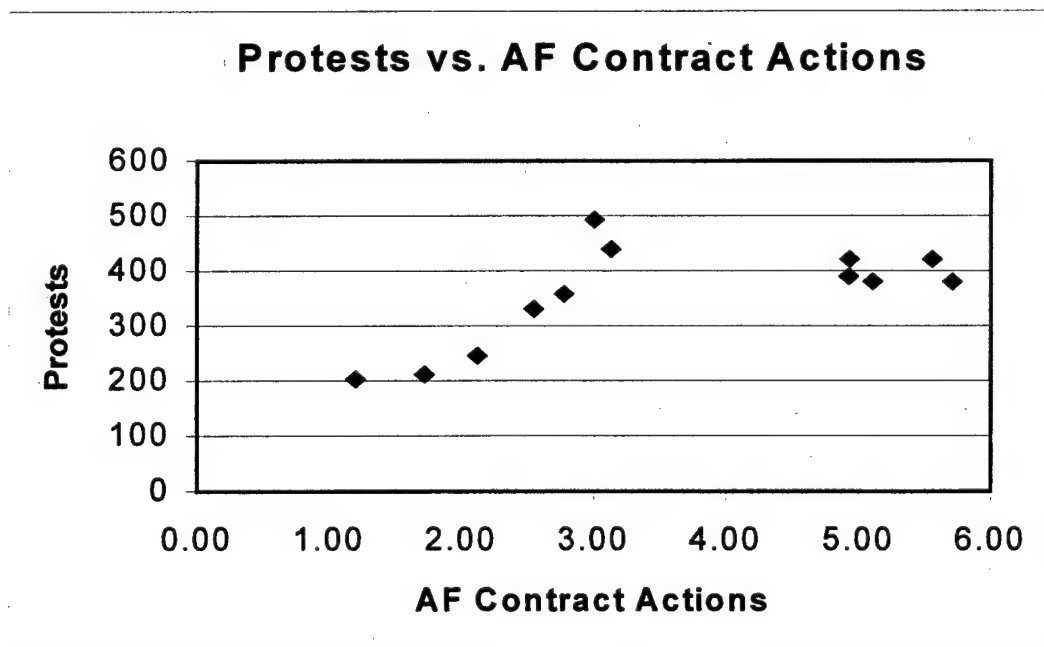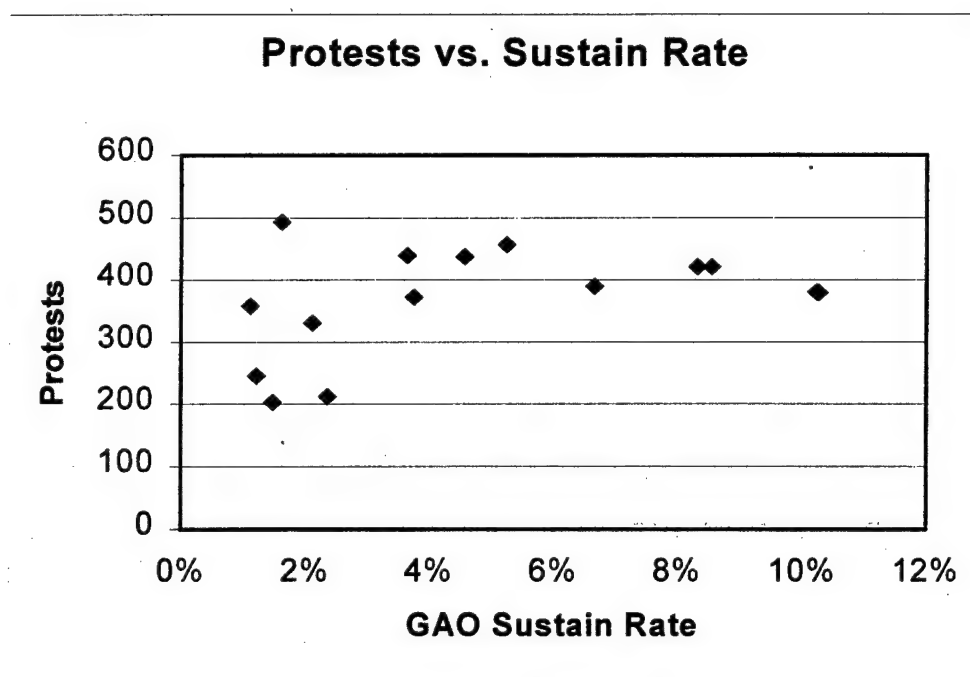

Figure 6: AF GAO-Protests Processed vs. AF-GAO Sustain Rate Scattergram

The scatterplot suggests there may be a general tendency for the number of protests to increase as the number of GAO Sustain rate increases; however, the relationship appears

to be weak. While a linear relationship is highly questionable, there may be evidence of a quadratic fit in the data.

Single Quantitative Independent Variable #4: Unemployment Rate. A scattergram displays the possible relationship between protests and the unemployment rate for analysis. A visual inspection of Figure 7 reveals a possible relationship between

Protests vs Unemployment Rate
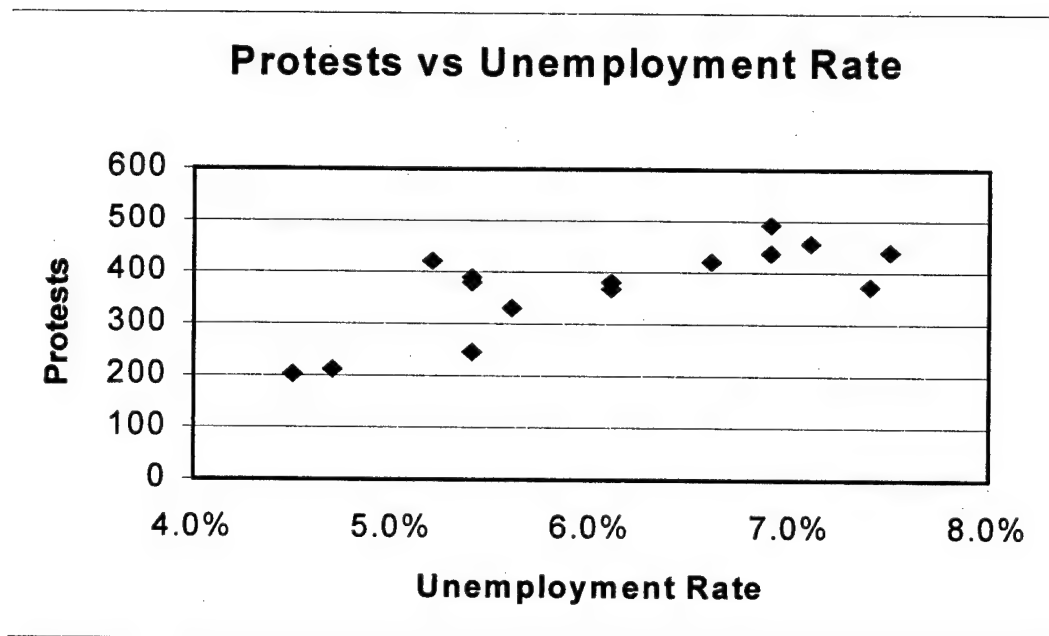

Figure 7: AF GAO-Protests Processed vs. Unemployment Rate Scattergram

the variables. The scatterplot suggests there is a general tendency for the number of protests to increase as the unemployment rate increases and the relationship appears to be linear.

Using Multiple Regression to Estimate AF GAO-Protests Processed

Table 2 specifies the dependent variable and independent variables used to develop the multiple regression model. The data obtained from SAF/AQCX and the United States Statistical Abstract provides the necessary information to estimate the model coefficients (the β parameters). The following subsections breakdown each step of the model formulation and subsequent testing in the study.

Step 1: Hypothesize The Model Relating Protests to the Independent Variables.

The first step is to hypothesize a model relating AF GAO-Protests Processed to the independent variables listed in Table 2. Chapter II presents a justification for the inclusion of the independent variables as factors affecting the decision to file a protest. The study proposes the following model:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \epsilon$$

y = AF GAO-Protests Processed
x_1 = AF Contract Awards
x_2 = AF Contract Dollars
x_3 = AF-GAO sustain rate
x_4 = U.S. unemployment rate (General Economic Condition)
x_5 = 0 if CICA prior to FASA/FAR 15 rewrite; 1 if CICA after FASA/FAR 15 rewrite
ϵ = random error component
β_0 = y-intercept of the line

The variable x_5 is a dummy variable used to describe an independent variable (acquisition reform) not measured on a numerical scale; it is qualitative (categorical) in nature.

Step 2: Estimating the Model Coefficients.

In order to estimate the model coefficients, a sample of AF-GAO protests (1984-1998) and the respective independent

variables (x_1, x_2,...x_5) are inputted into the JMP statistical software. Table 3 lists the output for the multiple regression.

Table 3. JMP Printout for Multiple Regression (AF GAO-Protests Processed)

<div style="border:1px solid black">

Response: Protests
Summary of Fit

RSquare	0.952286
RSquare Adj	0.912525
Root Mean Square Error	27.28684
Mean of Response	357.1667
Observations (or Sum Wgts)	12

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	**20.272254**	104.3099	0.19	0.8523
Actions	**69.518997**	24.77486	2.81	0.0309
Dollars	**-1.146441**	2.869498	-0.40	0.7033
Sust Rate	**-23.81523**	6.47227	-3.68	0.0103
Unemp	**42.747369**	14.31356	2.99	0.0244
Acq Reform[0-1]	**36.40437**	18.64652	1.95	0.0987

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob>F
Model	5	89162.237	17832.4	**23.9499**	**.0007**
Error	6	4467.430	744.6		
C Total	11	93629.667			

</div>

Table 3 highlights the estimated betas, F statistic, and P-Value for ease of reference in the subsequent analysis. The least squares model is:

$$\text{y-hat} = 20.27 + 69.52x_1 - 1.15x_2 - 23.82x_3 - 42.75x_4 - 36.40x_5 + \in$$

60

Step 3: Probability Distribution of the Random Error Component (ϵ).   Next,

the analysis specifies the probability distribution of the random error component.

Multiple regression procedures require that ϵ is normally distributed with a mean of zero

and a constant variance σ [$\epsilon \sim N (0, \sigma^2)$]). In addition, the errors are assumed

independent. The estimate of the variance, shown in Table 3 as Mean Square (Residual),

is:

$$s^2 = \frac{SSE}{N-(k+1)} = \frac{4467.4430}{12-(6)} = 744.57$$

The estimate of the standard deviation on the JMP printout as standard error is $s = \sqrt{s^2}$

which is 27.286. This means that the majority of y values (AF GAO-Protests Processed)

fall within $2s = 2(27.286) = 54.57$ of the least squares predicted values.

Step 4: Evaluate Usefulness of the Model. The next step of the data analysis

consists of determining the usefulness of the model in predicting protests. In summary,

the model **must** pass the overall F-test to merit further consideration in predicting the

number of protests (McLave and Benson, 1998: 579). Using the V-Heuristic (Reynolds,

1998), the elements of the overall test of the model follows.

a) **Assumptions:** The standard regression assumptions about the random error
   component

   apply.
   $\epsilon \sim N (0, \sigma^2)$
   The alpha level for the test is: $\alpha = .05$

b) $H_O : \beta_1 = \beta_2 = \ldots = \beta_5 = 0$ H_A : At least one of the model coefficients is
   nonzero.
   $Y = \beta_0 + \epsilon$ $Y = \beta_0 + \beta_1(x_1) + \beta_2(x_2) + \beta_3(x_3) + \beta_4(x_4) + \beta_5(x_5) +$
   ϵ **Reduced Model**   **Full Model**

61

c) **Test statistic:** $F^* = \dfrac{\text{Mean Square (Model)}}{\text{MSE}} = 23.9499$ (See Table 3)

$$F_{.05} = V_1 \text{ Parameter} = 2$$
$$V_2 \text{ Parameter} = n - (k+1) = 12 - 3 = 9$$
$$F_{.05} \approx 4.26 \text{ (from Table IX of Appendix B in McLave-Benson)}$$

d) **Decision Rule:** If F^* is greater than $F_{.05}$ the null hypothesis shall be rejected; else fail to reject the null hypothesis. If the P-Value is greater than $\alpha = .05$ the null hypothesis shall be rejected; else fail to reject the null hypothesis.

e) **Knowledge Claim:** $F^* = 23.9499 > F_{.05} \approx 4.26$; therefore F^* does fall in the rejection region. As the testing indicates that one of the betas differ from zero; the researcher rejects the null hypothesis at an alpha level of .05.

f) **Value Claim:** There is sufficient evidence to indicate that the overall model is useful in predicting the number of AF GAO-Protests Processed; however, further testing is required to determine the contributions by each independent variable.

Step 5: Testing the Contributions of the Independent Variables to Model Usefulness. If the acquisition reforms associated with FASA/FAR 15 rewrite influenced the AF GAO-Protests Processed, the mean number of protests differ for the respective periods (represented by the qualitative variable). Does the data provide evidence that the number of protests change in response to acquisition reforms symbolized by FASA and the FAR 15 rewrite (efficiency changes)? This test holds the quantitative independent variables constant and the following hypothesis testing applies:

a) **Hypotheses for testing:** $H_O : \beta_5 = 0$ $\qquad H_A : \beta_5 > 0$

b) **Test statistic:** $t^* = \dfrac{36.40437}{18.64652} = 1.95$ (See Table 3)

$$t_{.05} \text{ (with 5 degrees of freedom)} = 2.015$$
$$\text{(From inside cover table in McLave-Benson)}$$

c) **Decision Rule:** If t* is greater than $t_{.05}$ the null hypothesis shall be rejected; else fail to reject the null hypothesis. If the P-Value is greater than $\alpha = .05$ the null hypothesis shall be rejected; else fail to reject the null hypothesis.

c) **Knowledge Claim:** t* = $1.95 < t_{.05} \approx 2.015$; therefore t* does not fall in the rejection region. Therefore, the null hypothesis is not rejected at an alpha level of .05. In addition, the observed significance level (.0987) exceeds alpha (.05); evidence does not exist to reject the null hypothesis.

d) **Value Claim:** There **is not** sufficient evidence to indicate that the acquisition reform is useful in predicting the number of AF GAO-Protests Processed in the multiple regression model.

Measuring the Contribution of the Quantitative Independent Variables

This section presents a breakdown of the t-ratios and significance level of the quantitative variables for evaluation. As with the acquisition reform hypothesis testing, the values are compared with the $t_{.05} = 2.015$ and $\alpha = .05$. Table 4 presents a breakdown of the results of the hypothesis testing:

Table 4. Utility of Quantitative Variables in Multiple Regression Model

Variable	t-ratio	Prob>t	Useful to Multiple Regression Model?
Actions	2.81	0.0309	YES
Dollars	-0.4	0.7033	NO
Sust Rate	-3.68	0.0103	YES
Unemp Rate	2.99	0.0244	YES

From Table 4, the study concludes that AF Contract Action, the GAO Sustain Rate, and the Unemployment Rate (general economic conditions) specifically contribute to the usefulness of the model. On the other hand, AF Contract Dollars are not statistically significant in the multiple regression model; therefore, the variable is removed for the next step of the data analysis.

Step 6: Using the Model for Estimation/Prediction—The Selected Model. The statistical analysis culminates with the test of the model for estimation and/or prediction. AF Contract Dollars and Acquisition Reform **do not contribute** to the usefulness of the model; therefore, they have been removed. **For this step, the researcher selects the following multiple regression model for estimation/prediction:**

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \epsilon$$

y = AF GAO-Protests Processed
x_1 = AF Contract Awards
x_2 = AF-GAO sustain rate
x_3 = U.S. unemployment rate (General Economic Condition)
ϵ = random error component
β_0 = y-intercept of the line

Table 5 depicts the results of the regression analysis.

Table 5. JMP Printout for Selected Model (AF GAO-Protests Processed)

```
                          Response:  Protests
                          Summary of Fit
                    RSquare                          0.91921
                    RSquare Adj                      0.888913
                    Root Mean Square Error           30.74976
                    Mean of Response                 357.1667
                    Observations (or Sum Wgts)             12


                          Parameter Estimates
         Term          Estimate    Std Error    t Ratio   Prob>|t|    VIF
         Intercept    -148.9268    62.97584      -2.36    0.0456      0
         Actions       74.179263   16.9237        4.38    0.0023      8.45
         Sust Rate    -21.00627     7.05774      -2.98    0.0177      7.97
         Unemp         58.499826   11.71663       4.99    0.0011      1.22


                          Analysis of Variance
    Source     DF     Sum of Squares     Mean Square     F Ratio     Prob>F
    Model      3        86065.286         28688.4        30.3405     0.0001
    Error      8         7564.380           945.5
    C Total    11       93629.667
```

When compared to the full model used in Table 3, the selected model displays a higher F-Ratio and a lower significance level. This improvement in the model (by removing the acquisition reform and AF Contract Dollars) is evident with this change in the statistics measuring overall usefulness. In addition, R^2 = .919 implies over 91% of the variation in AF GAO-Protests Processed for the years sampled can be accounted for by this model.

From Table 5, the study derives the following least squares model:

y-hat = -148 + (74.2)x_1 - (21)x_2 + (58.5)x_3 + ϵ

Table 6 contains the predicted values versus the actual values associated with the model.

Table 6. AF GAO-Protests Processed (Predicted vs. Actual)

Year	Actual Protests	Predicted Protests
1987	381	377.4272
1988	390	398.1916
1989	421	398.7001
1990	380	386.6373
1991	421	435.1947
1992	440	445.9111
1993	493	443.8231
1994	368	390.3909
1995	331	323.2094
1996	246	298.6046
1997	212	215.6617
1998	203	172.2483

Residual Analysis—Model Aptness Testing. The study tests the model
assumptions with the Wilk-Shapiro test of normality and a plot of the residuals. Table 7
shows a Wilk-Shapiro score of .964; consistent with the assumptions.

Table 7. Normality Test of Residuals (Selected Model)

Shapiro-Wilk W Test	
W	Prob<W
0.964099	0.7850

The plot of the residuals in Figure 8 reveals scatter above and below the plane in the residual plot. There appears to be a random pattern of residuals around the horizontal 0 (mean of the residuals); therefore, the selected model stands to provide an adequate source for predicting AF GAO-Protests Processed.
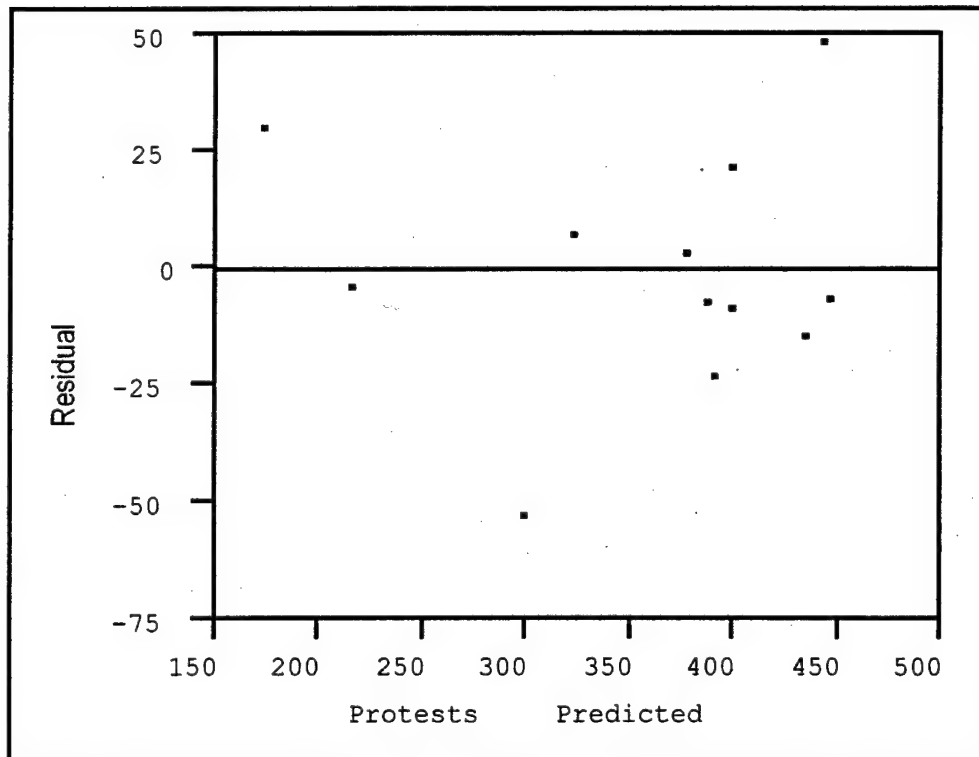

Figure 8. Residual Plot (Selected Multiple Regression Model)

Summary of Statistical Results

An application of multiple regression techniques to determine whether Air Force contract protest frequency rises or falls with changes in the five independent variables yields the following statistical results:

- There is sufficient evidence to indicate that AF Contract Actions may be useful in predicting the number of AF-GAO Protests-Processed

- There is insufficient evidence to indicate that AF Contract Dollars may be useful in predicting the number of AF-GAO Protests-Processed

- There is sufficient evidence to indicate that GAO Sustain Rate is useful in predicting the number of AF-GAO Protests-Processed

- There is sufficient evidence to indicate that the Unemployment Rate (General Economic Condition) may be useful in predicting AF-GAO Protests-Processed

- There is insufficient evidence to indicate that Acquisition Reform is useful in predicting the number of AF-GAO Protests-Processed

In order to make an accurate assessment of the independent variables' effect on bid protests; this data analysis provides an objective look at protest trends and associated conditions to the Air Force. While the results of the research have not established causal relationships, the statistical correlation provides Air Force decision-makers a tool to identify trends in contract protest frequency.

Summary

This chapter provides a data analysis of the protest trends from 1984-1998 and regression analysis of the impact of quantitative and qualitative variables. It offers a breakdown of the statistical results and a multiple regression model for use in predicting AF GAO-Protests Processed. The analysis concludes with statistical insight on other factors besides the acquisition reform initiatives that may influence the number of protests filed.

How have the acquisition reforms affected the number of AF GAO-Protests Processed? Have the number of contract dollars and actions affected these numbers in conjunction with the reforms? Does the GAO sustain rate have a statistical impact on the numbers of protests filed in the AF? Do general economic conditions have any impact on the numbers of protests filed in the AF? Chapter IV presents statistical results concerning the listed questions; however, the next chapter draws conclusions and recommendations from these results.

V. Conclusions and Recommendations

Overview

This chapter restates the research problem and objectives formulated in Chapter I to ensure adequate coverage in the study. Chapter V presents a condensed version of the statistical results on which to draw relevant conclusions for the AF decision-maker and acquisition professional. Next, the researcher proposes a list of recommended areas of study based on the findings of this thesis. The study concludes with a brief discussion of the limitations of the study and a final summary.

Revisiting the Problem

The previous chapter uses statistical analysis to meet the research objectives; however, a reiteration of the research problem puts the results into appropriate context. This study investigates the influence of AF Contract Dollars, AF Contract Actions, AF-GAO sustain rate, Acquisition Reform initiatives, and general economic conditions on the number of AF GAO-Protests Processed. A quantitative study of these external factors provides AF decision-makers and acquisition professionals a tool to identify trends in contract protest frequency.

The regression analysis provides a broad statistical analysis of the number of Air Force-GAO Protests Processed as correlated to the variables. A primary purpose is to determine if acquisition reform initiatives make a statistical impact on the number of protests filed. Since multiple regression is used, the researcher exercises extreme caution in interpreting the results of the analysis. The conclusions drawn from this study do not

point to the cause of a protest; however, they direct attention to the conditions that tend to coincide with an increase in the number of protests. Correlation is not causation; therefore, the results are limited to the appropriate level of meaning for this statistical analysis.

Meeting the Objectives of the Thesis

Identify Trends in the Number of Protests Filed from 1984 to 1998. A linear graph of AF-GAO protests reveals the general trends from 1984-1998. From 1984 to 1992, there was a stable period (albeit at a higher level) of contractor protests with little variability. From the data, it appears that the CICA-only period resulted in an elevated number of protests as compared to the subsequent years. In 1993, the number of protests jumps to nearly 500 for the year. FASA was implemented in 1994 and the FAR 15 rewrite became effective in 1997; however, the impact of such reforms on the number of protests is unclear.

Following 1993, protests follow a sharp downward trend and ultimately reach the lowest point of 202 in 1998. While an observer might point to the introduction of acquisition reform as the reason for the decline, an analysis of other factors illuminate the complexity associated with the contractor's protest decision. It should be noted that in the1990s there has been a sharp decline in AF Contract Actions, AF Contract Dollars, and low unemployment (positive economic condition). The visual observation of the protest trends warrants an analysis of these other factors' influence on the number of protests.

<u>Identify the Protest Trends Associated with the AF Contract Actions and Dollars.</u>

Chapter IV analyzes a possible relationship between AF Contract Actions and the AF GAO-Protests Processed. The scatterplot suggests there is a general tendency for the number of protests to increase as the number of AF Contract Actions increases; however, the relationship may not be linear. When the number of actions approach 4 million, the number of protests experiences a decrease. The decrease in protests appears to flatten out to around 400 protests when AF Contract Actions are between 5 and 6 million. Before discussing the significance of these results, the study analyzes the number of actions as compared to the dollars awarded over the period.

With regard to AF Contract dollars, the scatterplot suggests there is a general tendency for the number of protests to increase as the number of AF Contract Dollars increases; however the relationship may not be linear. The number of protests increases in a linear manner up to 50 billion dollars; however, they experience a slight decline after this point. When compared to the number of contract actions, the relationship to contract dollars bears a closer resemblance to a linear model.

The data analysis reveals that increases in the number of AF Contract Actions and Dollars generally lead to an increase in the number of protests. Chapter II discusses the possibility of leaner budgets leading to an increased number of protests. Increases in the number of contract actions (as enhancing the exposure to a protest) might explain an increase in the numbers. The data support the assertions related to the contract actions; however, the findings about the dollars run contrary to the expected results. Instead of thicker competition in the lean times leading to an increased number of protests, the AF GAO-Protests Processed decline. Contractors may perceive a larger pot of AF Dollars

available for award; therefore, they are more likely to file a protest. Subsequent sections expand on the statistical significance of the relationship between AF Contract Actions/Dollars and AF-GAO Protest Processed.

Identify the Protest Trends Associated with the AF-GAO Sustain Rate. Chapter IV analysis reveals a possible relationship between the AF-GAO sustain rate and the AF GAO-Protests Processed. The scatterplot suggests a general tendency for the number of protests to increase as the GAO Sustain rate increases; therefore, the findings lend credence to assertions in this study. In Chapter II, the Lieberman study brings the significance of the protest forum to light in the contractor's decision to file a protest. The data support the conclusion that the number of AF GAO-Protests Processed declines as contractors encounter less success at the GAO.

A number of lawmakers and acquisition professionals quickly point to contractor consolidation, fewer contracts, and changes brought about by acquisition reform leading to the reduction in protests. The AF-GAO sustain rate is often overlooked as a contributing factor to the reduction in protests. Even as protests have declined in the late 1990s, the AF-GAO sustain rate has reduced to below 2%. The statistical analysis presents support for the influence of the AF-GAO sustain rate on the number of AF GAO-Protests Processed.

Identify the Protest Trends Associated with General Economic Conditions. The data analysis shows the possible relationship between the General Economic Conditions (represented by the unemployment rate) and the number of AF GAO-Protests Processed. The scatterplot suggests there is a general tendency for the number of protests to increase as the unemployment rate increases and the relationship appears to be linear. The

literature review discusses the issue of whether an increase in protests is associated with perceived economic bad times. With the unemployment rate chosen to represent economic condition, the number of protests tends to decline with the unemployment rate. The researcher carefully tempers conclusions in this area because many indices exist to measure the health of the economy.

In periods of increased unemployment, the number of protests tends to increase. Contractors may be experiencing a decline in commercial business (negative influences in the economy) and be more likely to challenge an AF contract award in perceived bad times. Furthermore, the periods of lower unemployment are associated with a decline in the AF GAO-Protests Processed. The perceived good times may equate to improved commercial business for contractors; therefore, a failure to receive an AF contract award would be less pronounced. In any event, the statistical results concerning the unemployment rate in the study present additional support to the assertion.

<u>Identify the Protest Trends Associated with Acquisition Reform.</u> Chapter II discusses the dramatic changes brought about by CICA to the bid protest mechanism. With substantial new grounds under which to file a protest, the CICA period appears to follow a consistent (albeit higher) level of protest frequency. Chapter II explains the push for equity and increased power of the contractor in the protest process; therefore, the researcher expects a higher level of protest between 1984-1994. The data supports that an increased level of AF-GAO Protest Processed is associated with the CICA-only period.

FASA and the FAR 15 rewrite have been classified as efficiency changes by this study based on the findings of the literature review. In addition, the reforms of the 1990s

encourage an increased level of judgement by the contracting officer and enhanced communication between the parties. AF GAO-Protests Processed reaches a highpoint of 493 in 1993; however, they decline to 368 in the following year. Following 1994 (the year FASA was implemented) protests continue to follow a downward trend. Furthermore, the FAR 15 rewrite (implemented in 1997) is associated with a continued decline in the number of AF GAO-Protests Processed. The researcher bases these observations on the graphical representations of the trends; however, a statistical analysis probes deeper into the relationship.

The Main Objectives. The remaining objectives relate to the statistical analysis used by this study and form the basis for conclusions to be drawn in relation to the hypothesis. These objectives are listed as:

- Determine if a significant statistical relationship exists between acquisition reform and the number of protests filed in the AF.

- Determine if a significant statistical relationship exists between the contract actions, dollars awarded, GAO Sustain Rate and General Economic Condition with the amount AF GAO-Protests Processed.

- Test and evaluate the factors using multiple regression analysis.

Chapter IV states the necessary assumptions for the use of regression techniques and tests the relationships for statistical significance. The next subsections list the propositions and hypotheses from Chapter I related to the statistical findings. From these findings, the study presents a discussion of the statistical results and draws conclusions for the AF decision-maker.

<u>Discussion of Results</u>

Table 8 provides a breakdown of the results from Chapter IV for review and convenience to the reader. The independent variables are listed in the left column with the corresponding statistical significance to AF GAO-Protests Processed.

Table 8: Condensed Results from Chapter IV

Term	t-ratio	Prob>t	Useful to estimation and prediction?
Actions	2.81	0.0309	YES
Dollars	-0.4	0.7033	NO
Sust Rate	-3.68	0.0103	YES
Unemployment Rate	2.99	0.0244	YES
Acq Reform (0-1)	1.95	0.0987	NO

A presentation of each hypothesis and conclusions follow in the following sections.

<u>Hypothesis #1.</u> **An increase in the number of AF contract actions will decrease the number AF GAO-Protests Processed from 1985-1998.** The regression analysis indicates the statistical significance of the number of AF Contract Actions in relation to the number of AF GAO-Protests Processed; therefore, the data support the existence of a relationship. Table 8 shows the relationship based on multiple regression techniques; however, the nature of the relationship runs contrary to Hypothesis #1. The analysis shows a tendency for the number of protests to increase with the number of contract actions up to approximately 3 million; however, they begin to decline beyond

4.9 million. For this reason, the study concludes that AF-GAO protests will follow an upward trend with the increase in actions; however, they stabilize at a certain point. These findings lead to a rejection of hypothesis #1; an increase in contract actions does not necessarily lead to a reduction in protests.

The decrease in the number of AF GAO-Protests Processed as associated with fewer actions may be due to less exposure to contractors. Quite simply, contractors may have fewer opportunities to file a protest and/or AF Contracting Personnel have fewer opportunities to incite a protest. This relatively simple explanation runs contrary to the expected competitive behavior to "win the contract;" therefore, further explanation should be sought.

The decline in protests for the period examined (1984-1998) has been associated with a high degree of consolidation in the U.S. defense industry. Since 1982, the number of major systems defense contractors has been reduced from 51 to 5 (Boeing, Raytheon, Litton, Lockheed Martin, and Northrup Grumman). With the reduced number of contractors and fewer AF-Contract Actions, there may have been reduced opportunities to protest. While this may explain the reduction in protests as AF Contract Actions decrease, the large numbers of non-systems related actions beg explanation.

For the above-mentioned reasons, extreme caution should be used when making generalizations beyond the period examined. The data and statistical tests indicate that contract actions may contribute to the increased number of protests; however, this single factor in a unique period should be viewed in the context of the observations.

Hypothesis #2. **An increase in the AF contract dollars will lead to a decrease in AF GAO-Protests Processed.** The regression analysis indicates that the number of AF contract dollars is not statistically significant in relation to the number of AF-GAO Protests. The number of protests appear to follow an upward trend with increases in AF Contract Dollars. These findings lead to rejection of hypothesis #2; an increase of dollars does not necessarily lead to a decrease in protests.

Hypothesis #2 was based on the premise that increases in the contract dollars available would lead contractors to perceive more opportunities for contracts. This assumes that *everybody's chance to get a contract* increases with more dollars, thereby reducing the likelihood of protest. The data over the time period covered appear to run contrary to this assumption.

Table 8 shows the statistical insignificance of AF Contract Dollars to AF GAO-Protests Processed between 1984-1998. The lack of a relationship may be due to the Department of Defense budget procedure. AF Contracting personnel and federal contractors exhibit the least amount of control in determining the budget; therefore, the AF Contract Dollars may be seen as less of a factor. On the other hand, the contracting parties enjoy a higher degree of control with AF Contract Actions (i.e. AF Contracting determines nature of the business activities and the contractors compete for these contract actions).

As mentioned in hypothesis #1, the study must be viewed with increased care due to the unique nature of the period covered. The data and statistical tests indicate that contract dollars may not contribute to the increased number of protests; however, broad generalizations beyond this period should be tempered with multivariate analysis.

Hypothesis #3. **An increase in AF-GAO sustain rate can be associated with an increase in the number AF GAO-Protests Processed.** The regression analysis indicates that the number of AF-GAO sustain rate is statistically significant in relation to the number of AF-GAO Protests. The data supports hypothesis #3 with a correlation between the rise and fall of the mentioned variables. In summary, it appears that protest frequency is linked to the contractors' likelihood of success at the GAO.

With this hypothesis accepted, the researcher asks: do AF GAO-Protests Processed decline because the AF-GAO Sustain rate increases? Table 8 reveals that the AF-GAO Sustain rate bears the strongest relationship to the AF GAO-Protests Processed. In Chapter II, Lieberman predicted a reduction in the protest numbers with less chance of relief at the GAO; the data support this assertion.

Hypothesis #4. **Periods of higher unemployment can be associated with increases in the number of AF GAO-Protests Processed.** The data analysis shows the statistical significance of the U.S. unemployment rate (general economic conditions) in relation to the AF GAO-Protests Processed over the specified period. Table 8 displays the strong relationship (second only to the AF-GAO Sustain Rate) and Chapter IV's graphical analysis demonstrates the increased number of protests associated with a higher unemployment rate. Consequently, the data support the relationship discussed in Hypothesis #4.

From the data, the researcher concludes that a downturn in the economy (signified by an increase in the unemployment rate) may bring about an increase in the number of protests. The perceived bad times would cause the contractor to battle for economic

survival in the commercial and public sectors of the economy. In addition, periods of relative prosperity and good times in the economy (signified by a decrease in the unemployment rate) will be associated with fewer protests.

These conclusions should be viewed with care. The study used the unemployment rate to gauge general economic condition; however, multiple macroeconomic factors exist to measure economic performance.

Hypothesis #5. **The introduction of FASA and FAR 15 rewrite (efficiency changes) did not reduce the mean number of AF GAO-Protests Processed.** The regression analysis indicates that FASA/FAR 15 rewrite (efficiency changes) is not statistically significant in relation to the number of AF-GAO Protests. In the regression analysis, dummy variables represent periods of equity versus efficiency reforms. The 0-1 coding tested for a relationship to the slope of the line in the multiple regression model; therefore, the influence on these periods was categorized. Based on the statistical tests, hypothesis #6 should not be rejected; however, major limitations in the data limit application of the results.

During the period associated with CICA, AF-GAO Protests follow a relatively stable trend. A sharp decrease occurs in the period following 1993-1994; however, the statistical relationship to FASA or the FAR 15 rewrite is insignificant. While the data should not be used to claim that acquisition reform is insignificant, the researcher concludes that attributing the downturn in protests to policy changes may be simplistic.

A variety of factors contribute to the decision to file a protest; reforming the protest system or rewriting sections of the FAR may not be the strongest influence. In

viewing the protest numbers, increases or decreases may be due to external factors beyond the control of lawmakers or acquisition professionals.

Cantor contends that lawmakers may have reached a point of "leaving well enough alone" with the bid protest process (Cantor, 1997: 155). Table 8 shows the statistical insignificance of acquisition reform relative to other external factors; therefore, these findings may support Cantor's assertion. Cantor also warns that sanctions against frivolous protests and "efficiency changes" promise to discourage the number of protests. Again, the statistical findings do not support the acquisition reforms associated with efficiency as having a *chilling effect* (term used by Cantor) on the number of protests.

The researcher concludes that the reasons behind the decision to file a protest are complex and dynamic; therefore, it is difficult to influence the behavior with a series of reforms. The study does not pronounce a verdict regarding the efficiency reforms; however, the variety of external factors (independent of acquisition reform) influencing the protest decision are brought to light. With regard to reforming the bid protest system or initiating a plethora of reforms, lawmakers should address the value added by additional legislation.

Implications for the AF Decision-Maker/Acquisition Professional

The implications of this study to AF decision-makers and acquisition professionals will be discussed on the respective levels. Both groups should recognize that this study did not process numbers from a regression analysis to find the root cause of the AF GAO-Protests Processed. The study provides a tool to aid in understanding the

complexity of the decision to file a protest and allows for recognition of the factors that can be associated with changes in the protest numbers.

On a macro level (lawmakers, SAF/AQCX), the study provides a management tool to aid in forecasting the number of GAO protests for a particular year. An understanding of regression analysis or complex analysis is not necessary; decision-makers should recognize the legitimacy of a variety of factors affecting the number of protests. Instead of attributing the decline of protests only to policy/law changes, the study broadens the view of protests with previously untested variables. A decline in the number of protests in the 1990s may be due to fewer contract actions, contract dollars, and relatively positive economic times. The changes brought about by FASA and the FAR 15 rewrite may have influenced the numbers; however, the correlation appears to be weak.

The future conditions will provide a rigorous test for the changes brought about by acquisition reform. If the number of AF Contract Actions and Dollars increases and a general economic downturn occurs, will the number of protests remain at the lower levels? How long will the downward trend continue? The data (1984-1998) indicate that the number of protests may rise in correspondence to these other factors; however, this assertion goes beyond the scope of this study.

On a micro level, the study does not suggest contracting officers keep a daily watch on economic indictors to determine the likelihood of a protest. On the other hand, these acquisition professionals should be aware of the external factors (beyond their control) that may influence the protest decision. During a source selection or bid opening, the contracting officer will receive the inevitable question: what are the chances

of receiving a protest? The answer to the question may not be influenced by inequity in the bidding process or improper actions by the agency. This study acknowledges the existence of the other factors and provides acquisition professionals additional resources to view the likelihood of a protest.

The contracting officer's experience and knowledge of a particular situation can combine with the results of this study to produce a powerful tool. During the course of an acquisition, the contracting officer may be able to conduct a risk analysis of the possibility of receiving the protest based on the factors outlined in the study. Instead of taking a protest avoidance attitude, the agency may acknowledge one of the external factors as the variable that pushes contractor into the protest arena.

Recommendations For Future Study

Based on the results of this study, the following are recommendations for future study:

- Employ the regression model using different independent variables such as: number of AF agency protests, number of defense contractors, etc.

- With the same regression model, integrate the economic impact on the number of protests with other general economic conditions (GNP, inflation).

- Perform a statistical analysis of AF Protests in all forums (GAO, Federal Courts, Court of Claims) to increase the generalizability of this model and broad applicability of the results. The increased number of forums/data points would improve the reliability and validity of statistical analysis in this area.

- The results of this study can be triangulated with qualitative techniques such as telephone surveys, e-mail surveys, formal surveys, or interviews to test the validity of the chosen regression model.

- With a qualitative design, send out a survey to industry (contractors) to determine the other factors (economic health of the company, high level support for the RFP team, quid pro qou) that motivate the decision to file a protest. The qualitative portion of the research will serve as the basis for a statistical analysis of the factors.

- Perform a time-series analysis on the protest data. Such a study would require at least 20 years of data to provide a meaningful time-series analysis. The researcher must prove that the years are dependent upon each other and compare various periods with each other for variability.

Limitations of the Study

The data gathered from SAF/AQCX covers AF GAO-Protests Processed between 1984-1998. Any predictions beyond this period in another protest forum bear the risk of grossly inaccurate predictions due to the nature of the regression analysis and necessary assumptions.

Conclusion

Management questions regarding acquisition reform and external factors related to the number of protests in the AF were addressed in this study. While it is difficult to quantify the impact of acquisition reform initiatives on the amount of protests filed, the legitimacy of the external factors was established. No single factor could be labeled as

the cause of a protest; however, certain conditions appear to contribute to the trends in the number of protests filed.

While care has been taken to interpret the statistical results, equal care should be taken in attributing any changes to policy adjustment. The external factors appear to affect the numbers of protests filed more than acquisition reform initiatives; therefore, AF acquisition professionals should take care in pointing to FASA or the FAR 15 rewrite as the sole cause of the recent decline.

Bibliography

Adelson, Dennis. "The New Bid Protest Procedures," Contract Management: 5-10 (June 1996).

Baumer Donald C. and Carl E. Van Horn. The Politics of Unemployment. Washington D.C: Congressional Quarterly Press, 1985.

Cantor, Jonathan R. "Bid Protests and Procurement Reform: The Case for Leaving Well Enough Alone," Public Contract Law Journal, 27: 155-178 (Fall 1997).

Cibinic, John Jr. and Ralph C. Nash. Formation of Government Contracts. Washington DC: George Washington University, 1998.

Coburn, George M. "The New Bid Protest Remedies Created by the Competition in Contracting Act of 1984," National Contract Management Journal, 19: 47-60 (Summer 1985).

Cook Thomas D. and Charles S. Reichardt. Qualitative and Quantitative Methods in Evaluation Research. London: Sage Publications, 1979.

Cooper, Donald R. and C. William Emory. Business Research Methods. 5th Edition Boston: Irwin McGraw-Hill, 1995.

Creswell, John W. Research Design: Qualitative and Quantitative Approaches. Thousand Oaks CA: Saga Publications, Inc., 1994.

Department of Defense. "Federal Acquisition Regulation; Part 15 Rewrite; Contracting by Negotiation and Competitive Range Determination," Federal Register: 51224-51229 (September 30, 1997).

Department of Commerce. Statistical Abstract of the United States 1992. Washington D.C: Government Printing Office, 1992.

Department of Commerce. Statistical Abstract of the United States 1997. Washington DC: Government Printing Office, 1997.

Duncan, Eric C. The Impact of the Federal Acquisition Streamlining Act of 1994 on Post-Award Protest Frequency. MS Thesis, AFIT/GCM/LAS/97S-3. School of Logistics and Acquisition, Air Force Institute of Technology (AU), Wright-Patterson AFB, OH, September 1997.

Educational Services Institute. Procurement Reform 1995 and The Federal Acquisition Streamlining Act of 1994: A Guide. Arlington VA: Educational Services Institute, 1995.

Fausti, John J. and Lori M. Lee. "Understanding the New Administrative Bid Protest Process," Contract Management: 10-14 (January 1997).

Gamboa, Anthony H. "Senior Protest Attorney Identifies Evolution In Protest Practice And Decisions," The Government Contractor, issue 40, number 22: 3-4 (June 3, 1998).

Gamboa, Anthony H. and others. "GAO Protests In Post-FASA Era Of Increased Flexibility," The Government Contractor, issue 39, number 21: 3-8 (May 28, 1997).

General Accounting Office. "GAO Protests Drop By 18%," The Government Contractor, issue 40, number 4: 7-8 (January 28, 1998).

General Services Administration. The Federal Acquisition Regulation (FAR). Chicago IL: Commerce Clearing House, 1997.

Gansler, Jacques S. The Defense Industry. Cambridge MA: MIT Press, 1980.

Garofolo, Gene. Secrets of Competitive Bidding. Englewood Cliffs, NJ: Prentice Hall, 1990.

Gordon, Daniel I. "GAO Protests Continue To Decline In First Half Of FY 1998," The Government Contractor, issue 40, number 20: 4-5 (May 20, 1998).

Gottman, John M. Time Series Analysis. New York: Cambridge University Press, 1981.

Janoski, Thomas. The Political Economy of Unemployment. Los Angeles: University of California Press, 1990.

Kachigan, Sam Kash. Statistical Analysis. New York: Radius Press, 1982.

Kendall, M.G. Time Series. New York: Hafner Press, 1973.

Lall, Betty G. and John Tepper Marlin. Building A Peace Economy: Opporunities and Problems of Post-Cold War Defense Cuts. Boulder: Westview Press, 1992.

Lieberman, Richard D. "Scorekeeping Bid Protests in Six Forums," Federal Contracts Report, 63: 2-23 (February 2, 1995).

McClave, James T., P. George Benson, and Terry Sincich. Statistics For Business And Economics. 7th Edition. New Jersey: Prentice Hall, 1998.

Metzger, David P., and Michael R. Golden. Protests: Litigation and Resolution of Protests at GAO. Washington DC: The George Washington University, 1997.

Miller, Delbert C. Handbook of Research Design and Social Measurement. Newbury Park, CA: Sage Publications, 1991.

Mintz, Alex. The Political Economy of Military Spending In The United States. London: Routledge, 1992.

Neter John, William Wasserman and Michael H. Kutner. Applied Linear Regression Models. 2nd Edition. Boston: Irwin, 1989.

Newman Isadore and Carolyn R. Benz. Qualitative-Quantitative Research Methodology. Carbondale: Southern Illinois University Press, 1998.

Reynolds, Daniel. Class Handout, STATS 535, Regression and the V-Heuristic. School of Engineering and Statistics, Air Force Institute of Technology, Wright-Patterson AFB, OH, December 1998.

Secretary of Air Force/Acquisition (SAF/AQ). "Protests, Backgrounds/Trends," http://www.safaq.hq.af.mil/contracting/policy/AQCO/part33/fy97. 18 Aug 1998.

Thomas, David R. An Examination of the Effects of the Federal Acquisition Streamlining Act of 1994 on the Post-Award Debriefing Process and Bid Protest Frequency. MS Thesis, AFIT/GCM/LSL/97S-13. School of Logistics and Acquisition, Air Force Institute of Technology (AU), Wright-Patterson AFB, OH, September 1997.

U.S. Government. Office of Management and Budget. Executive Office of the President. The United States Budget In Brief: Fiscal Year 1990. Washington: Government Printing Office, 1991.

Vita

Captain Raymond M. Barben was born on 13 July 1971 in Cleveland, Ohio. He graduated from Chanel High School in Bedford, Ohio in May 1989. He entered undergraduate studies at Bowling Green State University in Bowling Green, Ohio where he graduated Cum Laude with a Bachelor of Arts in Political Science in May 1994. He was commissioned through the Detachment 620 AFROTC at Bowling Green State University where he was recognized as a Distinguished Graduate and nominated for a Regular Commission.

His first assignment was at Randolph AFB as a student of Undergraduate Navigator Training (SUNT) in September 1994. In June 1995, he was assigned to the 11th Contracting Squadron, Bolling AFB where he served as a construction contracts manager, commodities buyer, and services contracting officer. He was recognized as Contracting CGO of the Year 1995 and 1997 and the Logistics CGO of the Year 1997. In May 1998, he entered the Graduate Contracting Management program, School of Logistics and Acquisition Management, Air Force Institute of Technology. Upon graduation, he will be assigned to ASC/LPK (Engine/Propulsion SPO), Wright-Patterson AFB.

Permanent Address: 739 Saddlewood Avenue
                     Centerville, OH 45459

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	September 1999	Master's Thesis

4. TITLE AND SUBTITLE

THE IMPACT OF ACQUISITION REFORM AND POLITICAL-FISCAL VARIABLES ON AIR FORCE GAO-PROTESTS PROCESSED

5. FUNDING NUMBERS

6. AUTHOR(S)

Raymond M. Barben, Captain, USAF

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Air Force Institute of Technology
2750 P Street
WPAFB OH 45433-7765

8. PERFORMING ORGANIZATION REPORT NUMBER

AFIT/GCM/LAS/99S-1

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

SAF/AQC
1500 Wilson Blvd
Suite 700 (703) 588-7022
Arlington VA 22209

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

The purpose of this research was to determine whether the Air Force contract protest frequency rises or falls with reforms in the acquisition process, number of AF Contract Actions, number of AF Contract Dollars, AF-GAO Sustain Rate, and/or General Economic Conditions (represented by the U.S. unemployment rate). Specific management questions address the effectiveness of acquisition reform initiatives, a comparison to other external factors, and the identification of AF-GAO Protest trends between 1984 and 1998. The research problem was explored with a thorough literature review and formulation of a multiple regression model. The research identified the need to evaluate the impact of acquisition reform relative to the other quantitative factors.

In summary, the research provided a statistical tool to estimate and predict the AF GAO-Protests Processed relative to the the identified variables. The results indicated that AF Contract Actions, Dollars, and General Economic Conditions were statistically significant as a predictor; however, the GAO Sustain Rate was not useful. Finally, the acquisition reform qualitative variable was not statistically significant to the model. Since regression analysis was used, care should be exercised in using the model beyond the specified region.

14. SUBJECT TERMS

Air Force Procurement, Acquisition Reform, Bid Protest, Regression Analysis, Linear Regression Analysis, Economic Impact, Economic Analysis, Competition in Contracting Act (CICA), Federal Acquisition Streamlining Act (FASA), Federal Acquisition Regulation (FAR)

15. NUMBER OF PAGES

101

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

AFIT RESEARCH ASSESSMENT

The purpose of this questionnaire is to determine the potential for current and future applications of AFIT thesis research. **Please return completed questionnaire** to: AIR FORCE INSTITUTE OF TECHNOLOGY/ ENA 2950 P STREET, WRIGHT-PATTERSON AFB OH 45433-7765. Your response is **important.** Thank you.

1. Did this research contribute to a current research project?   a. Yes   b. No

2. Do you believe this research topic is significant enough that it would have been researched (or contracted) by your organization or another agency if AFIT had not researched it?

                                                        a. Yes   b. No

3. **Please estimate** what this research would have cost in terms of manpower and dollars if it had been accomplished under contract or if it had been done in-house.

      Man Years_____ $_____

4. Whether or not you were able to establish an equivalent value for this research (in Question 3), what is your estimate of its significance?

    a. Highly   b. Significant   c. Slightly   d. Of No
       Significant   Significant   Significance

5. Comments (Please feel free to use a separate sheet for more detailed answers and include it with this form):

_____   _____
Name and Grade   Organization

_____   _____
Position or Title   Address